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FILE 'REGISTRY' ENTERED AT 18:25:18 ON 22 MAR 2004

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FILE 'CAPLUS' ENTERED AT 18:27:25 ON 22 MAR 2004

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YOU HAVE REQUESTED DATA FROM 30 ANSWERS - CONTINUE? Y/(N):y

○ L2 ANSWER 1 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN  
ACCESSION NUMBER: 2004:78230 CAPLUS  
DOCUMENT NUMBER: 140:114274  
TITLE: Methods of making transition metal compounds useful as  
battery cathode active materials using electromagnetic  
radiation  
INVENTOR(S): Barker, Jeremy  
PATENT ASSIGNEE(S): UK  
SOURCE: U.S. Pat. Appl. Publ., 23 pp.  
CODEN: USXXCO  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2004016632	A1	20040129	US 2002-205748	20020726

PRIORITY APPLN. INFO.: US 2002-205748 20020726

AB In a method for synthesizing reduced metal compds. using electromagnetic radiation, starting materials comprising at least one particulate metal compound and at least one source of carbon are combined to form a mixture. The mixture is exposed to electromagnetic radiation to form a reaction product. Preferably, the carbon is a reducing carbon, and at least one metal of the starting materials is reduced in oxidation state during radiation exposure. Reducing carbon may be supplied by elemental carbon, by an organic material, or by mixts. Preferably, the solid state reactants also include an alkali metal compound. The products of the method are preferably useful as cathode active materials in lithium ion batteries. The electromagnetic radiation is selected from among microwave, IR, and radio frequencies of .apprx.1 MHz to 3000 GHz.

IT Secondary batteries  
(lithium; methods of making transition metal compds. useful as battery cathode active materials using electromagnetic radiation)

IT Battery cathodes

- Electromagnetic wave
- Solid phase synthesis
  - (methods of making transition metal compds. useful as battery cathode active materials using electromagnetic radiation)
- IT Alkali metal compounds
  - Carbohydrates, processes
  - Carbon black, processes
  - RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
  - (methods of making transition metal compds. useful as battery cathode active materials using electromagnetic radiation)
- IT Transition metal compounds
  - RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
  - (methods of making transition metal compds. useful as battery cathode active materials using electromagnetic radiation)
- IT Transition metal oxides
  - RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
  - (methods of making transition metal compds. useful as battery cathode active materials using electromagnetic radiation)
- IT Materials
  - (organic; methods of making transition metal compds. useful as battery cathode active materials using electromagnetic radiation)
- IT 57-50-1, Sucrose, processes 7439-89-6D, Iron, compound 7439-93-2D, Lithium, compound 7439-96-5D, Manganese, compound 7439-98-7D, Molybdenum, compound 7440-02-0D, Nickel, compound 7440-31-5D, Tin, compound 7440-32-6D, Titanium, compound 7440-44-0, Carbon, processes 7440-47-3D, Chromium, compound 7440-48-4D, Cobalt, compound 7440-50-8D, Copper, compound 7440-62-2D, Vanadium, compound 7782-42-5, Graphite, processes
  - RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
  - (methods of making transition metal compds. useful as battery cathode active materials using electromagnetic radiation)
- IT 11126-15-1, Lithium vanadium oxide 37296-91-6, Lithium molybdenum oxide 39302-37-9, Lithium titanium oxide
  - RL: DEV (Device component use); USES (Uses)
  - (methods of making transition metal compds. useful as battery cathode active materials using electromagnetic radiation)
- IT 7664-38-2DP, Phosphoric acid, transition metal compds. 69550-44-3P, Lithium molybdenum oxide  $\text{LiMoO}_2$  84159-18-2P, Lithium vanadium phosphate  $\text{Li}_3\text{V}_2(\text{PO}_4)_3$  160014-96-0P, Lithium molybdenum oxide  $\text{Li}_4\text{Mo}_3\text{O}_8$  610271-94-8P 632286-77-2P, Iron lithium magnesium phosphate  $(\text{Fe}_{0.9}\text{LiMg}_{0.1}\text{PO}_4)$ 
  - RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
  - (methods of making transition metal compds. useful as battery cathode active materials using electromagnetic radiation)
- IT 124-38-9, Carbon dioxide, formation (nonpreparative) 630-08-0, Carbon monoxide, formation (nonpreparative)

RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)  
(methods of making transition metal compds. useful as battery cathode  
active materials using electromagnetic radiation)  
IT 1333-74-0, Hydrogen, processes  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical  
process); PROC (Process)  
(reducing gas; methods of making transition metal compds. useful as  
battery cathode active materials using electromagnetic radiation)  
IT 12162-92-4P, Lithium vanadiumoxide LiV2O5  
RL: DEV (Device component use); SPN (Synthetic preparation); PREP  
(Preparation); USES (Uses)  
( $\gamma$ -; methods of making transition metal compds. useful as battery  
cathode active materials using electromagnetic radiation)

L2 ANSWER 2 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN  
ACCESSION NUMBER: 2004:59636 CAPLUS  
DOCUMENT NUMBER: 140:96916  
TITLE: Method of synthesizing electrochemically active  
materials from a slurry of precursors  
INVENTOR(S): Stoker, John; Hodge, James  
PATENT ASSIGNEE(S): USA  
SOURCE: U.S. Pat. Appl. Publ., 17 pp.  
CODEN: USXXCO  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2004013943	A1	20040122	US 2002-200823	20020722
WO 2004010515	A2	20040129	WO 2003-US22624	20030718

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,  
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,  
LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM,  
PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN,  
TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY,  
KG, KZ, MD, RU  
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, BG,  
CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC,  
NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG

PRIORITY APPLN. INFO.: US 2002-200823 A 20020722

AB A method for making an active material comprises the steps of forming a  
slurry, spray drying the slurry to form a powdered precursor composition, and  
heating the powdered precursor composition at a temperature and for a time sufficient  
to

form a reaction product. The slurry has a liquid phase and a solid phase,  
and contains at least an alkali metal compound and a transition metal compound

Preferably the liquid phase contains dissolved alkali metal compound, and the solid phase contains an insol. transition metal compound, an insol. carbonaceous material compound, or both. Electrodes and batteries are provided that contain the active materials.

- IT Dispersing agents  
(anionic; method of synthesizing electrochem. active materials from slurry of precursors)
- IT Battery electrodes  
Secondary batteries  
Slurries  
(method of synthesizing electrochem. active materials from slurry of precursors)
- IT Alkali metal compounds  
Carbohydrates, uses  
Carbonaceous materials (technological products)  
Hydrocarbons, uses  
Polymers, uses  
Transition metal compounds  
RL: DEV (Device component use); USES (Uses)  
(method of synthesizing electrochem. active materials from slurry of precursors)
- IT 25155-19-5D, Naphthalene sulfonic acid, salt  
RL: MOA (Modifier or additive use); USES (Uses)  
(dispersant; method of synthesizing electrochem. active materials from slurry of precursors)
- IT 7439-88-5D, Iridium, compound 7439-89-6D, Iron, compound 7439-93-2D, Lithium, compound 7439-95-4D, Magnesium, compound 7439-96-5D, Manganese, compound 7439-98-7D, Molybdenum, compound 7440-02-0D, Nickel, compound 7440-04-2D, Osmium, compound 7440-15-5D, Rhenium, compound 7440-24-6D, Strontium, compound 7440-33-7D, Tungsten, compound 7440-39-3D, Barium, compound 7440-41-7D, Beryllium, compound 7440-44-0, Carbon, uses 7440-47-3D, Chromium, compound 7440-48-4D, Cobalt, compound 7440-62-2D, Vanadium, compound 7440-66-6D, Zinc, compound 7440-70-2D, Calcium, compound 14066-19-4, Hydrogen Phosphate, uses 14066-20-7, DiHydrogen Phosphate, uses 14265-44-2, Phosphate, uses 15365-14-7, Iron lithium phosphate felipo4  
RL: DEV (Device component use); USES (Uses)  
(method of synthesizing electrochem. active materials from slurry of precursors)
- IT 349632-85-5P 632286-77-2P, Iron lithium magnesium phosphate  $\text{Fe}_{0.9}\text{LiMg}_{0.1}\text{PO}_4$  643752-34-5P, Iron lithium magnesium phosphate ( $\text{Fe}_{0.95}\text{LiMg}_{0.05}(\text{PO}_4)$ )  
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)  
(method of synthesizing electrochem. active materials from slurry of precursors)
- IT 25852-26-0D, Formaldehyde-naphthalene copolymer, sodium sulfonate  
25852-26-0D, Naphthalene formaldehyde copolymer, sulfonic acid salts  
RL: MOA (Modifier or additive use); USES (Uses)  
(method of synthesizing electrochem. active materials from slurry of

precursors)  
 IT 7732-18-5. Water, uses  
 RL: TEM (Technical or engineered material use); USES (Uses)  
 (method of synthesizing electrochem. active materials from slurry of precursors)

○ L2 ANSWER 3 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN  
 ACCESSION NUMBER: 2003:950942 CAPLUS  
 DOCUMENT NUMBER: 139:398062  
 TITLE: Synthesis of metal compounds useful as cathode active materials  
 INVENTOR(S): Barker, Jeremy; Saidi, Yazid M.; Swoyer, Jeffrey; Dong, Ming  
 PATENT ASSIGNEE(S): Valence Technology, Inc., USA  
 SOURCE: PCT Int. Appl., 78 pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 2  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003099715	A1	20031204	WO 2003-US14290	20030506
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
US 2003215715	A1	20031120	US 2002-150353	20020517
PRIORITY APPLN. INFO.:			US 2002-150343	A 20020517
			US 2002-150353	A 20020517
AB Active materials of the invention contain at least one alkali metal and at least one other metal capable of being oxidized to a higher oxidation state. Preferred other metals are accordingly selected from the group consisting of transition metals (defined as Groups 4-11 of the periodic table), as well as certain other nontransition materials such as tin, bismuth, and lead. The active materials may be synthesized in single step reactions or in multi-step reactions. In at least one of the steps of the synthesis reaction, reducing carbon is used as a starting material. In one aspect, the reducing carbon is provided by elemental carbon, preferably in particulate form such as graphites, amorphous carbon, carbon blacks and the like. In another aspect, reducing carbon may also be provided by an organic precursor material, or by a mixture of elemental carbon and organic				

- precursor material.
- IT Reduction  
(carbothermic; synthesis of metal compds. useful as cathode active materials)
- IT Oxides (inorganic), preparation  
Phosphates, preparation  
RL: SPN (Synthetic preparation); PREP (Preparation)  
(lithiated; synthesis of metal compds. useful as cathode active materials)
- IT Battery cathodes  
(synthesis of metal compds. useful as cathode active materials)
- IT Alkali metal compounds  
Butadiene rubber, processes  
Carbohydrates, processes  
Hydrocarbons, processes  
Transition metal compounds  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
(synthesis of metal compds. useful as cathode active materials)
- IT Carbonaceous materials (technological products)  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)  
(synthesis of metal compds. useful as cathode active materials)
- IT 9003-17-2  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
(butadiene rubber, synthesis of metal compds. useful as cathode active materials)
- IT 57-50-1, Sucrose, processes 554-13-2, Lithium carbonate 1309-37-1, Ferric oxide, processes 1310-66-3, Lithium hydroxide monohydrate 1313-27-5, Molybdenum oxide  $\text{MoO}_3$ , processes 1314-62-1, Vanadium oxide ( $\text{V}_2\text{O}_5$ ), processes 1333-74-0, Hydrogen, processes 7439-89-6D, Iron, compound 7439-93-2D, Lithium, compound 7439-96-5D, Manganese, compound 7439-98-7D, Molybdenum, compound 7440-02-0D, Nickel, compound 7440-31-5D, Tin, compound 7440-32-6D, Titanium, compound 7440-44-0, Carbon, processes 7440-47-3D, Chromium, compound 7440-48-4D, Cobalt, compound 7440-50-8D, Copper, compound 7440-62-2D, Vanadium, compound 14940-41-1, Ferrous phosphate 84159-18-2, Lithium vanadium phosphate  $\text{Li}_3\text{V}_2(\text{PO}_4)_3$   
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
(synthesis of metal compds. useful as cathode active materials)
- IT 18868-43-4P, Molybdenum oxide ( $\text{MoO}_2$ )  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)  
(synthesis of metal compds. useful as cathode active materials)
- IT 7664-38-2DP, Phosphoric acid, transition metal compds. 11126-15-1P, Lithium vanadium oxide 12162-92-4P, Lithium vanadium oxide  $\text{LiV}_2\text{O}_5$  15365-14-7P, Iron lithium phosphate  $\text{FeLiPO}_4$  37296-91-6P, Lithium molybdenum oxide 39302-37-9P, Lithium titanium oxide 39457-42-6P, Lithium manganese oxide 69550-44-3P, Lithium molybdenum oxide  $\text{LiMoO}_2$

108399-57-1P, Lithium molybdenum oxide  $\text{Li}_{0.74}\text{MoO}_2$  349632-76-4P,  
Iron lithium magnesium phosphate ( $\text{Fe}_{0.9}\text{LiMg}_{0.1}(\text{PO}_4)$ ) 349632-79-7P,  
Calcium iron lithium phosphate  $\text{Ca}_{0.1}\text{Fe}_{0.9}\text{LiPO}_4$  507242-52-6P, Lithium  
molybdenum oxide  $\text{Li}_{0.2}\text{MoO}_2$  507242-65-1P, Lithium molybdenum oxide  
 $\text{Li}_{0.85}\text{MoO}_2$

RL: SPN (Synthetic preparation); PREP (Preparation)

(synthesis of metal compds. useful as cathode active materials)

REFERENCE COUNT: 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 4 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2003:947998 CAPLUS

DOCUMENT NUMBER: 140:29489

TITLE: Nonaqueous electrolyte secondary battery using nickel  
metal oxide as anode active mass

INVENTOR(S): Kitano, Shinya

PATENT ASSIGNEE(S): Japan Storage Battery Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokyo Koho, 11 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2003346799	A2	20031205	JP 2002-151010	20020524

PRIORITY APPLN. INFO.: JP 2002-151010 20020524

AB The non-aqueous electrolytic battery comprises an anode containing an anode active mass containing  $\text{LiCoO}_2$  50-80,  $\text{LiMnO}_2$  10-30, and  $\text{LiFe}_{1-x}\text{Mn}_x\text{PO}_4$  ( $0 \leq x \leq 0.13$ ; M = Mg, Co, Ni, Mn, and/or Zn) 10-30 weight%. The non-aqueous electrolytic battery comprising the anode active mass is provided with excellent overcharging property and shows continuous voltage alteration at the time charging and discharging.

IT Secondary batteries  
(lithium; nonaq. electrolyte batter containing lithium compound mixture as anode active mass for good overcharging property)

IT Battery anodes  
(of nonaq. electrolyte secondary battery; nonaq. electrolyte batter containing lithium compound mixture as anode active mass for good overcharging property)

IT 12162-79-7, Lithium manganese oxide ( $\text{LiMnO}_2$ ) 12190-79-3, Cobalt lithium oxide ( $\text{CoLiO}_2$ ) 15365-14-7, Iron lithium phosphate ( $\text{LiFePO}_4$ ) 412351-36-1, Iron lithium manganese phosphate ( $\text{Fe}_{0.9}\text{LiMn}_{0.1}(\text{PO}_4)$ ) 632286-77-2 632286-78-3 632286-79-4 632286-80-7

RL: TEM (Technical or engineered material use); USES (Uses)  
(anode active mass containing; nonaq. electrolyte batter containing lithium compound mixture as anode active mass for good overcharging property)

L2 ANSWER 5 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2003:912686 CAPLUS  
 DOCUMENT NUMBER: 139:367603  
 TITLE: Methods of making transition metal compounds useful as  
 battery cathode active materials  
 INVENTOR(S): Barker, Jeremy; Saidi, M. Yazid; Swoyer, Jeffrey L.;  
 Dong, Ming  
 PATENT ASSIGNEE(S): Valence Technology, Inc., USA  
 SOURCE: U.S. Pat. Appl. Publ., 22 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 2  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2003215715	A1	20031120	US 2002-150353	20020517
WO 2003099715	A1	20031204	WO 2003-US14290	20030506
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				

PRIORITY APPLN. INFO.: US 2002-150343 A 20020517  
 US 2002-150353 A 20020517

AB A method for carrying out solid state reactions under reducing conditions  
 is provided. Solid state reactants include at least one inorg. metal  
 compound and a source of reducing carbon. The reaction may be carried out  
 in a reducing atmospheric in the presence of reducing carbon. Reducing carbon  
 may be supplied by elemental carbon, by an organic material, or by mixts.  
 The organic material is one that can form decomposition products containing carbon in  
 a form capable of acting as a reductant. The reaction proceeds without  
 significant covalent incorporation of organic material into the reaction  
 product. In a preferred embodiment, the solid state reactants also  
 include an alkali metal compound. The products of the method find use in  
 lithium ion batteries as cathode active materials. Preferred active  
 materials include lithium-transition metal phosphates and  
 lithium-transition metal oxides. In a preferred embodiment, the reaction  
 product contains carbon particles intimately mixed among crystals of the  
 active materials.

IT Reduction  
 (carbothermic; methods of making transition metal compds. useful as  
 battery cathode active materials)

IT Phosphates, uses



- RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)  
(lithiated; methods of making transition metal compds. useful as battery cathode active materials)
- IT Secondary batteries  
(lithium; methods of making transition metal compds. useful as battery cathode active materials)
- IT Battery cathodes  
(methods of making transition metal compds. useful as battery cathode active materials)
- IT Alkali metal compounds  
Butadiene rubber, processes  
Carbohydrates, processes  
Hydrocarbons, processes  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
(methods of making transition metal compds. useful as battery cathode active materials)
- IT Carbonaceous materials (technological products)  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)  
(methods of making transition metal compds. useful as battery cathode active materials)
- IT Transition metal compounds  
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)  
(methods of making transition metal compds. useful as battery cathode active materials)
- IT 9003-17-2  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
(butadiene rubber, methods of making transition metal compds. useful as battery cathode active materials)
- IT 57-50-1, Sucrose, processes 554-13-2, Lithium carbonate 1309-37-1, Ferric oxide, processes 1313-27-5, Molybdenum oxide  $\text{MoO}_3$ , processes 1333-74-0, Hydrogen, processes 1345-25-1, Ferrous oxide, processes 7439-93-2D, Lithium, compound  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
(methods of making transition metal compds. useful as battery cathode active materials)
- IT 18868-43-4P, Molybdenum dioxide **349632-76-4P**, Iron lithium magnesium phosphate ( $\text{Fe}_{0.9}\text{LiMg}_{0.1}(\text{PO}_4)$ )  
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)  
(methods of making transition metal compds. useful as battery cathode active materials)
- IT 12162-92-4P, Lithium vanadium oxide  $\text{LiV}_2\text{O}_5$  15365-14-7P, Iron lithium phosphate  $\text{FeLiPO}_4$  69550-44-3P, Lithium molybdenum oxide  $\text{LiMoO}_2$  84159-18-2P, Lithium vanadium phosphate  $\text{Li}_3\text{V}_2(\text{PO}_4)_3$  108399-57-1P,

Lithium molybdenum oxide  $\text{LiO}_{0.74}\text{MoO}_2$  349632-79-7P, Calcium iron lithium phosphate  $\text{Ca}_{0.1}\text{Fe}_{0.9}\text{LiPO}_4$  507242-65-1P, Lithium molybdenum oxide  $\text{LiO}_{0.85}\text{MoO}_2$

RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(methods of making transition metal compds. useful as battery cathode active materials)

IT 11126-15-1, Lithium vanadiumoxide 37296-91-6, Lithium molybdenum oxide 39302-37-9, Lithium titanium oxide 39457-42-6, Lithium manganese oxide  
RL: MOA (Modifier or additive use); USES (Uses)

(methods of making transition metal compds. useful as battery cathode active materials)

IT 7440-44-0, Carbon, uses

RL: MOA (Modifier or additive use); USES (Uses)

(particles; methods of making transition metal compds. useful as battery cathode active materials)

L2 ANSWER 6 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2003:717589 CAPLUS

DOCUMENT NUMBER: 139:233058

TITLE: Alkali transition metal phosphates and related  
electrode active materials

INVENTOR(S): Barker, Jeremy; Saidi, M. Yazid; Swoyer, Jeffrey L.

PATENT ASSIGNEE(S): UK

SOURCE: U.S. Pat. Appl. Publ., 14 pp.

CODEN: USXXCO

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2003170542	A1	20030911	US 2002-92317	20020306
WO 2003077335	A1	20030918	WO 2003-US6998	20030305

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

PRIORITY APPLN. INFO.: US 2002-92317 A 20020306

AB The invention concerns electrode active materials comprising lithium or other alkali metals, a transition metal, and a phosphate or similar moiety, of the formula:  $\text{Aa}+\text{xMbP1-xSixO4}$  wherein (1) A is selected from the

group consisting of Li, Na, K, and mixts. thereof, and  $0 < a < 1.0$  and  $0 \leq x \leq 1$  and (2) M comprises one or more metals, comprising at least one metal which is capable of undergoing oxidation to a higher valence state, where  $0 < b \leq 2$ ; and wherein M, a, b, and x are selected so as to maintain electroneutrality of the compound. In a preferred embodiment, M comprises at least one transition metal selected from Groups 4 to 11 of the Periodic Table. In another preferred embodiment, M comprises  $M'cM''d$ , where M' is at least one transition metal from Groups 4 to 11 of the Periodic Table; and M'' is at least one element from Groups 2, 3, 12, 13, or 14 of the Periodic Table, and  $c+d = b$ . Preferably,  $0.1 \leq a \leq 0.8$ . Preferred embodiments include those having a structure similar to the mineral olivine. This invention also provides electrodes comprising an electrode active material of this invention, and batteries that comprise a first electrode having an electrode active material of this invention; a second electrode; and an electrolyte.

IT Battery anodes

Battery cathodes

(alkali transition metal phosphates and related electrode active materials)

IT Oxides (inorganic), uses

RL: DEV (Device component use); USES (Uses)

(alkali transition metal phosphates and related electrode active materials)

IT Carbonaceous materials (technological products)

RL: MOA (Modifier or additive use); USES (Uses)

(alkali transition metal phosphates and related electrode active materials)

IT Chalcogenides

RL: DEV (Device component use); USES (Uses)

(metal; alkali transition metal phosphates and related electrode active materials)

IT 7440-44-0, Carbon, uses 7782-42-5, Graphite, uses

RL: DEV (Device component use); USES (Uses)

(alkali transition metal phosphates and related electrode active materials)

IT 595567-51-4P, Lithium nickel phosphate ( $\text{Li}_{0.5}\text{Ni}_{1.25}\text{PO}_4$ ) 595567-52-5P

595567-53-6P, Iron lithium magnesium phosphate ( $\text{FeLi}_{0.8}\text{Mg}_{0.1}\text{PO}_4$ )

595567-55-8P 595567-59-2P, Iron lithium magnesium manganese phosphate

( $\text{Fe}_{0.5}\text{Li}_{0.8}\text{Mg}_{0.1}\text{Mn}_{0.5}\text{PO}_4$ ) 595567-63-8P, Cobalt lithium magnesium phosphate ( $\text{Co}_{0.6}\text{Li}_{0.5}\text{Mg}_{0.65}\text{PO}_4$ )

RL: DEV (Device component use); SPN (Synthetic preparation); PREP

(Preparation); USES (Uses)

(alkali transition metal phosphates and related electrode active materials)

L2 ANSWER 7 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2003:532921 CAPLUS

DOCUMENT NUMBER: 139:87848

TITLE: Transition metal polyanion oxides as lithium ion intercalating structures for battery electrode

INVENTOR(S): Chiang, Yet-Ming; Chung, Sung-Yoon; Bloking, Jason T.;  
Andersson, Anna M.  
PATENT ASSIGNEE(S): Massachusetts Institute of Technology, USA  
SOURCE: PCT Int. Appl.. 122 pp.  
CODEN: PIXXD2  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003056646	A1	20030710	WO 2002-US41471	20021223
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				

US 2004005265	A1	20040108	US 2002-329046	20021223
PRIORITY APPLN. INFO.:			US 2001-343060P	P 20011221
			US 2002-388721P	P 20020614
			US 2002-412656P	P 20020920

AB The invention concerns a compound comprising a composition  $A.(M'1-aM'a)y(XD4)z$ ,  $Ax.(M'1-aM'a)y(DXD4)z$ , or  $Ax.(M'1-aM'a)y(X2D7)z$ , and have values such that  $x$ , plus  $y(1-a)$  times a formal valence or valences of  $M'$ , plus  $ya$  times a formal valence or valence of  $M'$ , is equal to  $z$  times a formal valence of the  $XD4$ ,  $X2D7$ , or  $DXD4$  group; or a compound comprising a composition  $(A1-aM'a)xM'y(XD4)z$ ,  $(A1-aM'a)xM'y(DXD4)z$ ,  $(A1-aM'a)xM'y(X2D7)z$  and have values such that  $(1-a)x$  plus the quantity  $ax$  times the formal valence or valences of  $M'$  plus  $y$  times the formal valence or valences of  $M'$  is equal to  $z$  times the formal valence of the  $XD4$ ,  $X2D7$  or  $DXD4$  group. In the compound,  $A$  is at least one of an alkali metal and hydrogen,  $M'$  is a first-row transition metal,  $X$  is at least one of phosphorus, sulfur, arsenic, molybdenum, and tungsten,  $M'$  any of a Group IIA, IIIA, IVA, VA, VIA, VIIA, VIIIA, IB, IIB, IIIB, IVB, VB, and VIB metal,  $D$  is at least one of oxygen, nitrogen, carbon, or a halogen,  $0.0001 < a \leq 0.1$ , and  $x$ ,  $y$ , and  $z$  are greater than zero. The compound can have a conductivity at  $27^\circ$  of at least about  $10^{-8}$  S/cm. The compound can be a doped lithium phosphate that can intercalate lithium or hydrogen. The compound can be used in an electrochem. device including electrodes and storage batteries and can have a gravimetric capacity of at least about 80 mA-h/g while being charged/discharged at greater than about C rate of the compound

IT Battery electrodes  
Electric conductivity  
Fuel cell electrodes

- Fuel cells  
Heat treatment  
Secondary batteries  
Solid state reaction  
    (transition metal polyanion oxides as lithium ion intercalating structures for battery electrode)
- IT Intercalation compounds  
    RL: DEV (Device component use); USES (Uses)  
        (transition metal polyanion oxides as lithium ion intercalating structures for battery electrode)
- IT 7439-95-4, Magnesium, uses 7439-96-5, Manganese, uses 7440-03-1, Niobium, uses 7440-25-7, Tantalum, uses 7440-32-6, Titanium, uses 7440-33-7, Tungsten, uses 7440-67-7, Zirconium, uses 15438-31-0, uses 20074-52-6, uses  
    RL: MOA (Modifier or additive use); USES (Uses)  
        (FeLiPO<sub>4</sub> doped with; transition metal polyanion oxides as lithium ion intercalating structures for battery electrode)
- IT 554-13-2, Lithium carbonate 6047-25-2, Ferrous oxalate dihydrate 7722-76-1, Ammonium dihydrogen phosphate  
    RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)  
        (transition metal polyanion oxides as lithium ion intercalating structures for battery electrode)
- IT 15365-14-7P, Iron lithium phosphate felipo<sub>4</sub> 223505-09-7P, Iron lithium titanium phosphate 411234-54-3P 478819-82-8P, Iron lithium titanium phosphate FeLi<sub>0.99</sub>Ti<sub>0.01</sub>(PO<sub>4</sub>) 478819-83-9P, Iron lithium niobium phosphate FeLi<sub>0.99</sub>Nb<sub>0.01</sub>(PO<sub>4</sub>) 478819-84-0P, Iron lithium magnesium phosphate FeLi<sub>0.99</sub>Mg<sub>0.01</sub>(PO<sub>4</sub>) 478819-85-1P, Aluminum iron titanium phosphate (Al<sub>0.01</sub>FeLi<sub>0.99</sub>(PO<sub>4</sub>)) 478819-87-3P, Iron lithium titanium phosphate Fe<sub>0.99</sub>LiTi<sub>0.01</sub>(PO<sub>4</sub>) 478819-89-5P, Iron lithium zirconium phosphate (Fe<sub>0.99</sub>LiZr<sub>0.01</sub>(PO<sub>4</sub>)) 496816-58-1P, Iron lithium zirconium phosphate (Fe<sub>0.98</sub>LiZr<sub>0.02</sub>(PO<sub>4</sub>)) 531493-25-1P, Iron lithium titanium phosphate Fe<sub>0.98</sub>LiTi<sub>0.02</sub>(PO<sub>4</sub>) 554453-36-0P 554453-37-1P 554453-38-2P 554453-39-3P 554453-40-6P 554453-41-7P **554453-42-8P** 554453-44-0P, Iron lithium zirconium phosphate (Fe<sub>0.95</sub>LiZr<sub>0.05</sub>(PO<sub>4</sub>)) 554453-45-1P, Iron lithium niobium phosphate (FeLi<sub>0.98</sub>Nb<sub>0.02</sub>(PO<sub>4</sub>)) 554453-46-2P, Iron lithium niobium phosphate (FeLi<sub>0.96</sub>Nb<sub>0.04</sub>(PO<sub>4</sub>)) 554453-47-3P, Iron lithium phosphate (Fe<sub>1.01</sub>Li<sub>0.99</sub>(PO<sub>4</sub>)) 554453-48-4P, Iron lithium phosphate (Fe<sub>0.99</sub>Li<sub>1.01</sub>(PO<sub>4</sub>))  
    RL: DEV (Device component use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)  
        (transition metal polyanion oxides as lithium ion intercalating structures for battery electrode)
- IT 7440-37-1, Argon, uses 7727-37-9, Nitrogen, uses  
    RL: TEM (Technical or engineered material use); USES (Uses)  
        (transition metal polyanion oxides as lithium ion intercalating structures for battery electrode)
- REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

- L2 ANSWER 8 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN
- ACCESSION NUMBER: 2003:125703 CAPLUS
- DOCUMENT NUMBER: 138:388269
- TITLE: HT-XRD study of synthetic ferrian magnesian spodumene: the effect of site dimension on the P21/c→C2/c phase transition
- AUTHOR(S): Camara, F.; Iezzi, G.; Oberti, R.
- CORPORATE SOURCE: Istituto di Geoscienze e Georisorse, CNR, Pavia, 27100, Italy
- SOURCE: Physics and Chemistry of Minerals (2003), 30(1), 20-30  
CODEN: PCMIDU; ISSN: 0342-1791
- PUBLISHER: Springer-Verlag
- DOCUMENT TYPE: Journal
- LANGUAGE: English
- AB Ferrian magnesian spodumene was synthesized in the MgO-Li<sub>2</sub>O-FeO-SiO<sub>2</sub>-H<sub>2</sub>O system at 0.4 GPa, 700°, with fO<sub>2</sub> = NNO + 2.3. The space group at room temperature is P21/c [a = 9.638(3), b = 8.709(2), c = 5.258(2) Å, β = 109.83(3)°, volume 415.2 Å<sup>3</sup>]. The structure is topol. equivalent to that of ferrian spodumene, LiFeSi<sub>2</sub>O<sub>6</sub>, and has two sym. independent tetrahedral chains, A and B, and two independent octahedral sites, M1 and M2. The crystal-chemical composition was determined combining electron microprobe, SIMS and single-crystal XRD anal., yielding M<sub>2</sub>(Li<sub>0.85</sub>Mg<sub>0.09</sub>Fe<sub>2+0.06</sub>)M<sub>1</sub>(Fe<sub>3+0.85</sub>Mg<sub>0.15</sub>)Si<sub>2</sub>O<sub>6</sub>. Li is ordered at the M2 site and Fe<sup>3+</sup> is ordered at the M1 site, whereas Mg (and Fe<sup>2+</sup>) distribute over both octahedral sites. Structure refinements done at different temps. (25, 70, 95, 125, 150 and 200 °C) allowed characterization of a reversible displacive P21/c→C2/c transition at 106°. Previous HT-XRD studies of Li-clinopyroxenes had shown that the transition temperature is inversely related to the size of the M1 cation. For the crystal of this work, the aggregate ionic radius at M1 is longer than that of ferrian spodumene, for which the transition temperature is -44°. The higher transition temperature observed can only be explained on the basis of the shorter aggregate radius at the M2 site (due to the presence of Mg substituting after Li), in keeping with the results obtained for ferromagnesian P21/c pyroxenes. The effects of all the chemical substitutions must be considered when modeling transition temps. and thermodyn. behavior in clinopyroxenes.
- IT Structural phase transition  
(high-temperature XRD study of synthetic magnesian iron spodumene showing effect of site dimension on the P21/c→C2/c phase transition)
- IT Bond angle  
Bond length  
(in synthetic magnesian iron spodumene)
- IT Order  
(in synthetic magnesian iron spodumene undergoing P21/c→C2/c phase transition at 106°)
- IT Crystal structure  
(of synthetic magnesian iron spodumene undergoing P21/c→C2/c phase transition at 106°)
- IT 528603-23-8, Iron lithium magnesium silicate

(Fe<sub>0.91</sub>Li<sub>0.85</sub>Mg<sub>0.24</sub>(SiO<sub>3</sub>)<sub>2</sub>)

RL: PRP (Properties)

(high-temperature XRD study of synthetic magnesian iron spodumene showing effect of site dimension on the P21/c→C2/c phase transition)

REFERENCE COUNT: 30 THERE ARE 30 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 9 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2003:83100 CAPLUS

DOCUMENT NUMBER: 138:341011

TITLE: Lithium iron(II) phospho-olivines prepared by a novel carbothermal reduction method

AUTHOR(S): Barker, J.; Saidi, M. Y.; Swoyer, J. L.

CORPORATE SOURCE: Valence Technology Incorporated, Henderson, NV, 89015, USA

SOURCE: Electrochemical and Solid-State Letters (2003), 6(3), A53-A55

CODEN: ESLEF6; ISSN: 1099-0062

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The electroactive materials LiFePO<sub>4</sub> and LiFe<sub>0.9</sub>Mg<sub>0.1</sub>PO<sub>4</sub> have been synthesized by a novel carbothermal reduction (CTR) method. The transition metal reduction and lithium incorporation processes are each facilitated by the high temperature carbothermal reaction based on the C→CO transition. These CTR conditions favor stabilization of the iron as Fe<sup>2+</sup> as well as offering some control of the product morphol. and conductivity Electrochem. evaluation of the CTR LiFe<sub>0.9</sub>Mg<sub>0.1</sub>PO<sub>4</sub> reveals a lithium insertion plateau around 3.4 V vs. Li together with a specific capacity of over 150 mAh/g. Differential capacity data confirm the two-phase nature of the insertion reactions as well as the outstanding ionic reversibility. Few tech. obstacles have been encountered in scaling the CTR process from a laboratory process to that required for pilot production

IT Reduction

(carbothermal; lithium iron(II) phospho-olivines prepared by novel carbothermal reduction method)

IT Battery electrodes

(lithium iron(II) phospho-olivines prepared by novel carbothermal reduction method)

IT Secondary batteries

(lithium; lithium iron(II) phospho-olivines prepared by novel carbothermal reduction method)

IT 15365-14-7P, Iron lithium phosphate FeLiPO<sub>4</sub> 349632-76-4P, Iron lithium magnesium phosphate (Fe<sub>0.9</sub>LiMg<sub>0.1</sub>(PO<sub>4</sub>))

RL: PRP (Properties); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(battery electrodes; lithium iron(II) phospho-olivines prepared by novel carbothermal reduction method)

REFERENCE COUNT: 19 THERE ARE 19 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 10 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:928099 CAPLUS

DOCUMENT NUMBER: 138:6481

TITLE: Process for producing carbon-containing lithium-iron composite phosphorus oxide for lithium secondary battery cathode active material .

INVENTOR(S): Kohzaki, Masao; Takeuchi, Youji; Ukyo, Yoshio

PATENT ASSIGNEE(S): Kabushiki Kaisha Toyota Chuo Kenkyusho, Japan

SOURCE: U.S. Pat. Appl. Publ., 11 pp.

CODEN: USXXCO

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2002182497	A1	20021205	US 2002-143946	20020514
JP 2003034534	A2	20030207	JP 2002-132603	20020508

PRIORITY APPLN. INFO.: JP 2001-145396 A 20010515

AB A carbon-containing lithium-iron composite phosphorus oxide for a lithium secondary battery pos. electrode active material, includes particles being composed of a lithium-iron composite phosphorus oxide having an olivine structure whose basic composition is  $\text{LiFePO}_4$ , and being composited with carbonaceous fine particles. A process for producing the same includes the steps of mixing a lithium compound making a lithium source, an iron compound making an iron source, a phosphorus-containing ammonium salt making a phosphorus source and carbonaceous fine particles, thereby preparing a mixture, and calcining the mixture at a temperature of from  $600^\circ$  or more to  $750^\circ$  or less.

IT Carbon black, uses

RL: MOA (Modifier or additive use); USES (Uses)

(composited with lithium iron phosphate; process for producing carbon-containing lithium-iron composite phosphorus oxide for lithium secondary battery cathode active material)

IT Secondary batteries

(lithium; process for producing carbon-containing lithium-iron composite phosphorus oxide for lithium secondary battery cathode active material)

IT Battery cathodes

(process for producing carbon-containing lithium-iron composite phosphorus oxide for lithium secondary battery cathode active material)

IT 15365-14-7P, Iron lithium phosphate  $\text{FeLiPO}_4$  476669-99-5P, Iron lithium manganese phosphate ( $\text{Fe}_{0.8-0.98}\text{LiMn}_{0.02-0.2}(\text{PO}_4)$ ) **476670-01-6P**, Iron lithium magnesium phosphate ( $\text{Fe}_{0.8-0.98}\text{LiMg}_{0.02-0.2}(\text{PO}_4)$ ) 476670-03-8P, Iron lithium nickel phosphate ( $\text{Fe}_{0.8-0.98}\text{LiNi}_{0.02-0.2}(\text{PO}_4)$ ) 476670-05-0P, Cobalt iron lithium phosphate ( $\text{Co}_{0.02-0.2}\text{Fe}_{0.8-0.98}\text{Li}(\text{PO}_4)$ ) 476670-07-2P, Copper iron lithium phosphate ( $\text{Cu}_{0.02-0.2}\text{Fe}_{0.8-0.98}\text{Li}(\text{PO}_4)$ ) 476670-10-7P, Iron lithium zinc phosphate ( $\text{Fe}_{0.8-0.98}\text{LiZn}_{0.02-0.2}(\text{PO}_4)$ ) 476670-12-9P, Germanium iron lithium phosphate ( $\text{Ge}_{0.02-0.2}\text{Fe}_{0.8-}$



0.98Li(P04))

RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(carbon composited; process for producing carbon-containing lithium-iron composite phosphorus oxide for lithium secondary battery cathode active material)

IT 7440-44-0. Carbon, uses

RL: MOA (Modifier or additive use); USES (Uses)

(composited with lithium iron phosphate; process for producing carbon-containing lithium-iron composite phosphorus oxide for lithium secondary battery cathode active material)

IT 516-03-0. Ferrous oxalate 554-13-2 7722-76-1, Ammonium dihydrogen phosphate

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)

(process for producing carbon-containing lithium-iron composite phosphorus oxide for lithium secondary battery cathode active material)

IT 412351-36-1P, Iron lithium manganese phosphate (Fe0.9LiMn0.1(P04))

476670-14-1P, Iron lithium manganese phosphate (Fe0.85LiMn0.15(P04))

RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(process for producing carbon-containing lithium-iron composite phosphorus oxide for lithium secondary battery cathode active material)

○ L2 ANSWER 11 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:794447 CAPLUS

DOCUMENT NUMBER: 138:41938

TITLE: Electronically conductive phospho-olivines as lithium storage electrodes

AUTHOR(S): Chung, Sung-Yoon; Bloking, Jason T.; Chiang, Yet-Ming

CORPORATE SOURCE: Department of Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA, 02139, USA

SOURCE: Nature Materials (2002), 1(2), 123-128

CODEN: NMAACR; ISSN: 1476-1122

PUBLISHER: Nature Publishing Group

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Lithium transition metal phosphates are of interest as storage cathodes for rechargeable Li batteries because of their high energy d., low raw materials cost, environmental friendliness and safety. Their key limitation was extremely low electronic conductivity, believed to be intrinsic to this family of compds. Controlled cation nonstoichiometry combined with solid-solution doping by metals supervalent to Li+ increases the electronic conductivity of LiFePO4 by a factor of .apprx.108. The resulting materials show near-theor. energy d. at low charge/discharge rates, and retain significant capacity with little polarization at rates as high as 6.000 mA/g. In a conventional cell design, they may allow development of Li batteries with the highest power d. yet.

IT Battery cathodes

(electronically conductive phospho-olivines as lithium storage cathodes for batteries)

IT 15365-14-7. Iron lithium phosphate ( $\text{FeLiPO}_4$ )  
 RL: DEV (Device component use); PRP (Properties); USES (Uses)  
 (doped; electronically conductive phospho-olivines as lithium storage cathodes for batteries)

IT 478819-81-7. Iron lithium zirconium phosphate ( $\text{FeLi}_{0.99}\text{Zr}_{0.01}(\text{PO}_4)$ )  
 478819-82-8. Iron lithium titanium phosphate ( $\text{FeLi}_{0.99}\text{Ti}_{0.01}(\text{PO}_4)$ )  
 478819-83-9. Iron lithium niobium phosphate ( $\text{FeLi}_{0.99}\text{Nb}_{0.01}(\text{PO}_4)$ )  
 478819-84-0. Iron lithium magnesium phosphate  
 ( $\text{FeLi}_{0.99}\text{Mg}_{0.01}(\text{PO}_4)$ ) 478819-85-1. Aluminum iron lithium phosphate  
 ( $\text{Al}_{0.01}\text{FeLi}_{0.99}(\text{PO}_4)$ ) 478819-86-2. Iron lithium niobium phosphate  
 ( $\text{Fe}_{0.99}\text{LiNb}_{0.01}(\text{PO}_4)$ ) 478819-87-3. Iron lithium titanium phosphate  
 ( $\text{Fe}_{0.99}\text{LiTi}_{0.01}(\text{PO}_4)$ ) 478819-89-5. Iron lithium zirconium phosphate  
 ( $\text{Fe}_{0.99}\text{LiZr}_{0.01}(\text{PO}_4)$ ) 478819-90-8. Aluminum iron lithium phosphate  
 ( $\text{Al}_{0.01}\text{Fe}_{0.99}\text{Li}(\text{PO}_4)$ ) 478819-92-0. Iron lithium magnesium  
 phosphate ( $\text{Fe}_{0.99}\text{LiMg}_{0.01}(\text{PO}_4)$ )  
 RL: DEV (Device component use); PRP (Properties); USES (Uses)  
 (electronically conductive phospho-olivines as lithium storage cathodes for batteries)

REFERENCE COUNT: 29 THERE ARE 29 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 12 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:573514 CAPLUS

DOCUMENT NUMBER: 137:143023

TITLE: secondary nonaqueous electrolyte battery

INVENTOR(S): Nakamura, Masaya; Saito, Hirohiko

PATENT ASSIGNEE(S): Denso Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 7 pp.  
 CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002216770	A2	20020802	JP 2001-13581	20010122
PRIORITY APPLN. INFO.:			JP 2001-13581	20010122

AB The battery is a Li battery using an olivine structured  $\text{LiMxFe}_{1-x}\text{PO}_4$  [ M = metal(s) excluding Fe;  $x = 0-0.5$ ] cathode active mass and contains a conductive control material, which cuts off elec. current in the battery when the conductivity of the cathode and/or anode drops sharply due to electrochem. doping and undoping. The conductive control material is preferably a material that can be p-doped, e.g., polyaniline or polypyrrole, and is in the cathode. The battery using the conductive control material and the cathode active mass has a high safety when overcharging and in hot environment.

IT Battery cathodes

- (cathodes containing lithium iron phosphate in secondary lithium batteries containing conductivity control materials)
- IT Safety  
(conductivity control materials in secondary lithium battery using cathode containing lithium iron phosphite for safety)
- IT Polyanilines  
RL: DEV (Device component use); USES (Uses)  
(conductivity control materials in secondary lithium battery using cathode containing lithium iron phosphite for safety)
- IT 15365-14-7, Iron lithium phosphate (FeLiPO<sub>4</sub>) 113066-78-7, Cobalt lithium nickel oxide (Co<sub>0.4</sub>LiNi<sub>0.6</sub>O<sub>2</sub>) 155472-68-7, Lithium manganese oxide (Li<sub>1.1</sub>Mn<sub>1.9</sub>O<sub>4</sub>) 190436-16-9 **349632-85-5** 444816-41-5  
444816-42-6, Aluminum iron lithium phosphate (Al<sub>0.2</sub>Fe<sub>0.8</sub>Li(PO<sub>4</sub>))  
444816-43-7 444816-44-8 444816-45-9 444816-47-1  
RL: DEV (Device component use); USES (Uses)  
(cathodes containing lithium iron phosphate in secondary lithium batteries containing conductivity control materials)
- IT 25233-30-1, Polyaniline  
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)  
(conductivity control materials in secondary lithium battery using cathode containing lithium iron phosphite for safety)

L2 ANSWER 13 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:428819 CAPLUS

DOCUMENT NUMBER: 137:8642

TITLE: Methods of making lithium metal compounds useful as cathode active materials in batteries

INVENTOR(S): Barker, Jeremy; Yazid, Saidi M.; Swoyer, Jeffrey L.

PATENT ASSIGNEE(S): Valence Technology, Inc., USA

SOURCE: PCT Int. Appl., 85 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002044084	A2	20020606	WO 2001-US43633	20011119
<p>W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM</p> <p>RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG</p>				
US 6645452	B1	20031111	US 2000-724085	20001128

AU 2002017799 A5 20020611 AU 2002-17799 20011119  
EP 1343720 A2 20030917 EP 2001-998506 20011119

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,  
IE, SI, LT, LV, FI, RO, MK, CY, AL, TR

PRIORITY APPLN. INFO.: US 2000-724085 A1 20001128  
WO 2001-US43633 W 20011119

AB The invention provides a novel method for making lithium mixed metal materials for battery cathodes. The lithium mixed metal materials comprise lithium and at least one other metal besides lithium. The invention involves the reaction of a metal compound, a phosphate compound, with a reducing agent to reduce the metal and form a metal phosphate. The invention also includes methods of making lithium metal oxides involving reaction of a lithium compound and a metal oxide with a reducing agent.

IT Reduction  
(carbothermic; methods of making lithium metal compds. useful as cathode active materials in batteries)

IT Secondary batteries  
(lithium; methods of making lithium metal compds. useful as cathode active materials in batteries)

IT Battery cathodes  
Thermite process  
(methods of making lithium metal compds. useful as cathode active materials in batteries)

IT 7664-38-2D, Phosphoric acid, transition metal compds. 7722-76-1, Ammonium dihydrogen phosphate 7757-87-1, Magnesium phosphate  $\text{Mg}_3(\text{PO}_4)_2$  7779-90-0, Zinc phosphate  $\text{Zn}_3(\text{PO}_4)_2$  7783-28-0, Diammonium hydrogen phosphate 7789-04-0, Chromium phosphate  $\text{CrPO}_4$  7789-24-4, Lithium fluoride, processes 10045-86-0, Iron phosphate  $\text{FePO}_4$  13453-80-0, Lithium dihydrogen phosphate 14154-09-7, Manganese phosphate  $\text{Mn}_3(\text{PO}_4)_2$  14940-41-1, Iron phosphate  $\text{Fe}_3(\text{PO}_4)_2$  70172-55-3, Titanium phosphate  $\text{TiPO}_4$

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)

(methods of making lithium metal compds. useful as cathode active materials in batteries)

IT 7664-38-2DP, Phosphoric acid, lithiated transition metal compds. 12162-92-4P, Lithium vanadium oxide  $\text{LiV}_2\text{O}_5$  15365-14-7P, Iron lithium phosphate  $\text{FeLiPO}_4$  84159-18-2P, Lithium vanadium phosphate  $\text{Li}_3\text{V}_2(\text{PO}_4)_3$  349632-76-4P, Iron lithium magnesium phosphate  $(\text{Fe}_{0.9}\text{LiMg}_{0.1}(\text{PO}_4))$  372075-82-6P, Lithium manganese fluoride phosphate  $\text{LiMnFP}_4$  372075-83-7P, Lithium vanadium fluoride phosphate  $(\text{LiVF}(\text{PO}_4))$  372075-84-8P, Chromium lithium fluoride phosphate  $\text{CrLiFP}_4$  372075-85-9P, Lithium titanium fluoride phosphate  $\text{LiTiFP}_4$  372075-86-0P 372075-87-1P, Iron lithium fluoride phosphate  $\text{FeLiFP}_4$  433708-98-6P, Copper lithium fluoride phosphate  $(\text{CuLiF}(\text{PO}_4))$  433708-99-7P, Cobalt lithium fluoride phosphate  $(\text{CoLiF}(\text{PO}_4))$  433709-00-3P, Lithium nickel fluoride phosphate  $(\text{LiNiF}(\text{PO}_4))$  433709-01-4P

RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(methods of making lithium metal compds. useful as cathode active

materials in batteries)  
IT 1333-74-0, Hydrogen, reactions  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(methods of making lithium metal compds. useful as cathode active materials in batteries)  
IT 124-38-9, Carbon dioxide, uses 630-08-0, Carbon monoxide, uses  
7440-37-1, Argon, uses 7727-37-9, Nitrogen, uses  
RL: TEM (Technical or engineered material use); USES (Uses)  
(methods of making lithium metal compds. useful as cathode active materials in batteries)  
IT 7440-44-0, Carbon, reactions  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(reducing agent; methods of making lithium metal compds. useful as cathode active materials in batteries)

L2 ANSWER 14 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:292205 CAPLUS

DOCUMENT NUMBER: 136:328153

TITLE: Nonaqueous electrolyte battery containing complex lithium oxide positive electrode with olivine crystal structure

INVENTOR(S): Fukushima, Gen; Hosoya, Mamoru; Hisayama, Junji; Takahashi, Kimio; Sato, Atsushi; Okawa, Takeshi

PATENT ASSIGNEE(S): Sony Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002117903	A2	20020419	JP 2000-306878	20001005
PRIORITY APPLN. INFO.:			JP 2000-306878	20001005

AB A battery comprises a neg. electrode, a pos. electrode from a compound  $\text{Li}_x\text{Fe}_1-y\text{MyPO}_4$  (M is Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B, Nb;  $x = 0.05-1.2$ ,  $y = 0-0.8$ ), and a separator. The pos. electrode compound has an olivine crystal structure. The combined volume (a) of the electrodes and volume (b) of separator satisfy the following conditions:  $0.17 \leq b/(a + b) \leq 0.39$ . The battery has improved balance of energy d.

IT Secondary battery separators  
(controlled volume of; nonaq. electrolyte battery containing complex lithium oxide pos. electrode with olivine crystal structure)

IT Secondary batteries  
(lithium; nonaq. electrolyte battery containing complex lithium oxide pos. electrode with olivine crystal structure)

IT Battery electrodes  
(nonaq. electrolyte battery containing complex lithium oxide pos. electrode with olivine crystal structure)

IT Olivine-group minerals  
RL: DEV (Device component use); USES (Uses)  
(nonaq. electrolyte battery containing complex lithium oxide pos. electrode with olivine crystal structure)

IT Crystal structure  
(olivine; nonaq. electrolyte battery containing complex lithium oxide pos. electrode with olivine crystal structure)

IT 15365-14-7 407629-83-8 407629-87-2 407629-90-7 407629-95-2  
407630-01-7 407630-05-1 407630-10-8 407630-14-2 407630-25-5.  
Aluminum iron lithium phosphate ( $\text{Al}_{0.7}\text{Fe}_{0.3}\text{Li}(\text{PO}_4)$ ) 407630-29-9, Gallium  
iron lithium phosphate ( $\text{Ga}_{0.7}\text{Fe}_{0.3}\text{Li}(\text{PO}_4)$ ) **407630-35-7**  
407630-40-4, Boron iron lithium phosphate ( $\text{B}_{0.75}\text{Fe}_{0.25}\text{Li}(\text{PO}_4)$ )  
407630-46-0 412267-84-6, Iron lithium zinc phosphate ( $\text{Fe}_{0.3}\text{LiZn}_{0.7}(\text{PO}_4)$ )  
RL: DEV (Device component use); USES (Uses)  
(pos. electrode containing; nonaq. electrolyte battery containing complex lithium oxide pos. electrode with olivine crystal structure)

L2 ANSWER 15 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:292166 CAPLUS

DOCUMENT NUMBER: 136:328120

TITLE: Nonaqueous electrolyte secondary battery with lithium complex oxide positive electrode mix additionally containing lithium carbonate for improved charge-discharge cycle characteristic at high temperature

INVENTOR(S): Hosoya, Mamoru; Fukushima, Gen

PATENT ASSIGNEE(S): Sony Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 14 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002117843	A2	20020419	JP 2000-306875	20001005

PRIORITY APPLN. INFO.: JP 2000-306875 20001005

AB A nonaq. electrolyte secondary battery comprises a  $\text{Li}_x\text{Fe}_{1-y}\text{M}_y\text{PO}_4$  (M is Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B, and/or Nb;  $x = 0.05-1.2$ ,  $y \leq 0.8$ ), pos. electrode active mix addnl. containing  $\text{Li}_2\text{CO}_3$ . The battery has improved charge-discharge cycle characteristic at high temperature

IT Battery cathodes  
(nonaq. electrolyte secondary battery with lithium complex oxide pos. electrode mix addnl. containing lithium carbonate for improved charge-discharge cycle characteristic at high temperature)

IT Olivine-group minerals  
RL: DEV (Device component use); USES (Uses)  
(nonaq. electrolyte secondary battery with lithium complex oxide pos. electrode mix addnl. containing lithium carbonate for improved

charge-discharge cycle characteristic at high temperature)  
IT 15365-14-7, Iron lithium phosphate ( $\text{FeLiPO}_4$ ) 407629-83-8 407629-87-2  
407629-90-7 407629-95-2 407630-01-7 407630-05-1 407630-10-8  
407630-14-2 407630-25-5, Aluminum iron lithium phosphate  
( $\text{Al}_{0.7}\text{Fe}_{0.3}\text{Li}(\text{PO}_4)$ ) 407630-29-9, Gallium iron lithium phosphate  
( $\text{Ga}_{0.7}\text{Fe}_{0.3}\text{Li}(\text{PO}_4)$ ) 407630-35-7 407630-40-4, Boron iron  
lithium phosphate ( $\text{B}_{0.75}\text{Fe}_{0.25}\text{Li}(\text{PO}_4)$ ) 407630-46-0 412267-84-6, Iron  
lithium zinc phosphate ( $\text{Fe}_{0.3}\text{LiZn}_{0.7}(\text{PO}_4)$ )  
RL: DEV (Device component use); USES (Uses)  
(nonaq. electrolyte secondary battery with lithium complex oxide pos.  
electrode mix addnl. containing lithium carbonate for improved  
charge-discharge cycle characteristic at high temperature)  
IT 554-13-2, Lithium carbonate  
RL: DEV (Device component use); MOA (Modifier or additive use); USES  
(Uses)  
(nonaq. electrolyte secondary battery with lithium complex oxide pos.  
electrode mix addnl. containing lithium carbonate for improved  
charge-discharge cycle characteristic at high temperature)

L2 ANSWER 16 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:272915 CAPLUS

DOCUMENT NUMBER: 136:297401

TITLE: Nonaqueous electrolyte battery with high discharge capacity

INVENTOR(S): Sakai, Hidecki; Fukushima, Yuzuru; Kuyama, Junji;  
Hosoya, Mamoru

PATENT ASSIGNEE(S): Sony Corporation, Japan

SOURCE: Eur. Pat. Appl., 17 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1195838	A2	20020410	EP 2001-123895	20011005
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 2002117908	A2	20020419	JP 2000-308303	20001006
CN 1348230	A	20020508	CN 2001-130350	20010930
US 2002150816	A1	20021017	US 2001-971912	20011005
TW 523945	B	20030311	TW 2001-90124693	20011005

PRIORITY APPLN. INFO.: JP 2000-308303 A 20001006

AB A nonaq. electrolyte cell is disclosed having high discharge capacity, an improved capacity upkeep ratio and optimum cyclic characteristics. The nonaq. electrolyte cell has a cell device including a strip-shaped cathode material and a strip-shaped anode material, layered and together via a separator and coiled a plural number of times, a nonaq. electrolyte solution, and a cell can for accommodating cell device and the nonaq. electrolyte

solution The cathode employs a cathode active material containing a compound of the olivine structure represented by the general formula  $\text{Li}_x\text{Fe}_{1-y}\text{M}_y\text{PO}_4$ , where M is at least one selected from the group consisting of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb, with  $0.05 \leq x \leq 1.2$  and  $0 \leq y \leq 0.8$ , with the compound being used either singly or in combination with other materials. The ratio of an inner diameter d to an outer diameter D of cell device is selected so that  $0.05 < d/D < 0.5$ .

- IT Secondary batteries  
(lithium; nonaq. electrolyte battery with high discharge capacity)
- IT Battery cathodes  
(nonaq. electrolyte battery with high discharge capacity)
- IT Carbon black, uses  
RL: DEV (Device component use); USES (Uses)  
(nonaq. electrolyte battery with high discharge capacity)
- IT Lithium alloy, base  
RL: DEV (Device component use); USES (Uses)  
(nonaq. electrolyte battery with high discharge capacity)
- IT 7439-93-2, Lithium, uses 15365-14-7, Iron lithium phosphate  $\text{FeLiPO}_4$   
407606-22-8, Chromium iron lithium phosphate ( $\text{Cr}_{0.05}\text{Fe}_{0.95}\text{LiPO}_4$ )  
407606-24-0, Cobalt iron lithium phosphate  
( $\text{Co}_{0.05}\text{Fe}_{0.95}\text{LiPO}_4$ ) 407606-26-2, Copper iron lithium  
phosphate ( $\text{Cu}_{0.05}\text{Fe}_{0.95}\text{LiPO}_4$ ) 407606-28-4, Aluminum iron  
lithium phosphate ( $\text{Al}_{0.05}\text{Fe}_{0.95}\text{LiPO}_4$ ) 407606-30-8, Gallium  
iron lithium phosphate ( $\text{Ga}_{0.05}\text{Fe}_{0.95}\text{LiPO}_4$ ) 407606-32-0,  
Boron iron lithium phosphate ( $\text{B}_{0.05}\text{Fe}_{0.95}\text{LiPO}_4$ ) 407606-34-2,  
Iron lithium manganese phosphate ( $\text{Fe}_{0.95}\text{Li}_{0.05}\text{Mn}_{0.05}\text{PO}_4$ )  
407606-36-4, Iron lithium nickel phosphate ( $\text{Fe}_{0.95}\text{Li}_{0.05}\text{Ni}_{0.05}\text{PO}_4$ )  
407606-39-7, Iron lithium vanadium phosphate ( $\text{Fe}_{0.95}\text{Li}_{0.05}\text{V}_{0.05}\text{PO}_4$ )  
407606-42-2, Iron lithium molybdenum phosphate  
( $\text{Fe}_{0.95}\text{Li}_{0.05}\text{Mo}_{0.05}\text{PO}_4$ ) 407606-44-4, Iron lithium titanium  
phosphate ( $\text{Fe}_{0.95}\text{Li}_{0.05}\text{Ti}_{0.05}\text{PO}_4$ ) 407606-47-7, Iron lithium zinc  
phosphate ( $\text{Fe}_{0.95}\text{Li}_{0.05}\text{Zn}_{0.05}\text{PO}_4$ ) **407606-49-9**, Iron  
lithium magnesium phosphate ( $\text{Fe}_{0.95}\text{Li}_{0.05}\text{Mg}_{0.05}\text{PO}_4$ ) 407606-51-3,  
Iron lithium niobium phosphate ( $\text{Fe}_{0.95}\text{Li}_{0.05}\text{Nb}_{0.05}\text{PO}_4$ )  
407629-83-8 407629-87-2 407629-90-7 407629-95-2 407630-01-7  
407630-05-1 407630-10-8 407630-14-2 407630-25-5, Aluminum iron  
lithium phosphate ( $\text{Al}_{0.7}\text{Fe}_{0.3}\text{LiPO}_4$ ) 407630-29-9, Gallium iron lithium  
phosphate ( $\text{Ga}_{0.7}\text{Fe}_{0.3}\text{LiPO}_4$ ) **407630-35-7** 407630-40-4, Boron  
iron lithium phosphate ( $\text{B}_{0.75}\text{Fe}_{0.25}\text{LiPO}_4$ ) 408501-54-2  
RL: DEV (Device component use); USES (Uses)  
(nonaq. electrolyte battery with high discharge capacity)

L2 ANSWER 17 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:272914 CAPLUS

DOCUMENT NUMBER: 136:297400

TITLE: Nonaqueous electrolyte secondary battery using  
olivine lithium phosphorus oxide cathode active  
material

INVENTOR(S): Okawa, Tsuyoshi; Hosoya, Mamoru; Kuyama, Junji;



PATENT ASSIGNEE(S): Fukushima, Yuzuru  
 SOURCE: Sony Corporation, Japan  
 Eur. Pat. Appl.. 15 pp.  
 CODEN: EPXXDW  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1195837	A2	20020410	EP 2001-123893	20011005
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 2002117907	A2	20020419	JP 2000-308302	20001006
CN 1350342	A	20020522	CN 2001-139303	20010930
US 2002106563	A1	20020808	US 2001-972375	20011005
PRIORITY APPLN. INFO.:			JP 2000-308302	A 20001006

AB In a battery, liquid leakage or destruction may be prevented as the apparent energy d. per unit volume of the cell is maintained. The cell uses, as a cathode active material, a compound of an olivinic crystal structure having the formula  $\text{Li}_x\text{Fe}_{1-x}\text{MPO}_4$ , where M is at least one selected from the group of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb and  $0.05 \leq x \leq 1.2$  and  $0 \leq y \leq 0.8$ . By adjusting the amount of the electrolyte solution, the amount of the void in the container is set so as to be not less than 0.14 mL and not more than 3.3 mL per 1 Ah of the cell capacity.

IT Secondary batteries  
 (lithium; nonaq. electrolyte secondary battery using olivinic lithium phosphorus oxide cathode active material)

IT Battery cathodes  
 Composites  
 (nonaq. electrolyte secondary battery using olivinic lithium phosphorus oxide cathode active material)

IT Coke  
 RL: DEV (Device component use); USES (Uses)  
 (pitch; nonaq. electrolyte secondary battery using olivinic lithium phosphorus oxide cathode active material)

IT 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 7440-44-0, Carbon, uses 15365-14-7, Iron lithium phosphate  $\text{FeLiPO}_4$  21324-40-3, Lithium hexafluorophosphate 407606-22-8, Chromium iron lithium phosphate ( $\text{Cr}_{0.05}\text{Fe}_{0.95}\text{Li}_{0.05}\text{PO}_4$ ) 407606-24-0, Cobalt iron lithium phosphate ( $\text{Co}_{0.05}\text{Fe}_{0.95}\text{Li}_{0.05}\text{PO}_4$ ) 407606-26-2, Copper iron lithium phosphate ( $\text{Cu}_{0.05}\text{Fe}_{0.95}\text{Li}_{0.05}\text{PO}_4$ ) 407606-28-4, Aluminum iron lithium phosphate ( $\text{Al}_{0.05}\text{Fe}_{0.95}\text{Li}_{0.05}\text{PO}_4$ ) 407606-30-8, Gallium iron lithium phosphate ( $\text{Ga}_{0.05}\text{Fe}_{0.95}\text{Li}_{0.05}\text{PO}_4$ ) 407606-32-0, Boron iron lithium phosphate ( $\text{B}_{0.05}\text{Fe}_{0.95}\text{Li}_{0.05}\text{PO}_4$ ) 407606-34-2, Iron lithium manganese phosphate ( $\text{Fe}_{0.95}\text{Li}_{0.05}\text{Mn}_{0.05}\text{PO}_4$ ) 407606-36-4, Iron lithium nickel phosphate ( $\text{Fe}_{0.95}\text{Li}_{0.05}\text{Ni}_{0.05}\text{PO}_4$ ) 407606-39-7, Iron lithium vanadium

phosphate ( $\text{Fe}_{0.2}\text{Li}_{0.05}\text{V}_{0.8}\text{PO}_4$ ) 407606-42-2, Iron lithium molybdenum phosphate ( $\text{Fe}_{0.2}\text{Li}_{0.05}\text{Mo}_{0.8}\text{PO}_4$ ) 407606-44-4, Iron lithium titanium phosphate ( $\text{Fe}_{0.2}\text{Li}_{0.05}\text{Ti}_{0.8}\text{PO}_4$ ) 407606-47-7, Iron lithium zinc phosphate ( $\text{Fe}_{0.2}\text{Li}_{0.05}\text{Zn}_{0.8}\text{PO}_4$ ) 407606-49-9, Iron lithium magnesium phosphate ( $\text{Fe}_{0.2}\text{Li}_{0.05}\text{Mg}_{0.8}\text{PO}_4$ ) 407606-51-3, Iron lithium niobium phosphate ( $\text{Fe}_{0.2}\text{Li}_{0.05}\text{Nb}_{0.8}\text{PO}_4$ ) 407629-83-8 407629-87-2 407629-90-7 407629-95-2 407630-01-7 407630-05-1 407630-10-8 407630-14-2 407630-19-7 407630-25-5, Aluminum iron lithium phosphate ( $\text{Al}_{0.7}\text{Fe}_{0.3}\text{LiPO}_4$ ) 407630-29-9, Gallium iron lithium phosphate ( $\text{Ga}_{0.7}\text{Fe}_{0.3}\text{LiPO}_4$ ) 407630-35-7 407630-40-4, Boron iron lithium phosphate ( $\text{B}_{0.75}\text{Fe}_{0.25}\text{LiPO}_4$ ) 407630-46-0  
RL: DEV (Device component use); USES (Uses)  
(nonaq. electrolyte secondary battery using olivinic lithium phosphorus oxide cathode active material)

L2 ANSWER 18 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:272913 CAPLUS

DOCUMENT NUMBER: 136:297399

TITLE: Nonaqueous electrolyte secondary battery with a compound of an olivinic structure as a cathode active material

INVENTOR(S): Okawa, Tsuyoshi; Hosoya, Mamoru; Kuyama, Junji; Fukushima, Yuzuru

PATENT ASSIGNEE(S): Sony Corporation, Japan

SOURCE: Eur. Pat. Appl., 15 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1195836	A2	20020410	EP 2001-123892	20011005
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 2002117833	A2	20020419	JP 2000-308301	20001006
CN 1349266	A	20020515	CN 2001-142412	20010930
US 2002106564	A1	20020808	US 2001-972395	20011005
US 6656635	B2	20031202		
TW 525312	B	20030321	TW 2001-90124680	20011005

PRIORITY APPLN. INFO.: JP 2000-308301 A 20001006

AB A non-aqueous electrolyte secondary cell containing a compound of an olivinic structure as a cathode active material is to be improved in load characteristics and cell capacity. To this end, there is provided a non-aqueous electrolyte secondary cell including a cathode having a layer of a cathode active material containing a compound represented by the general formula  $\text{Li}_x\text{Fe}_{1-y}\text{M}_y\text{PO}_4$ , where M is at least one selected from the group consisting of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb, with 0.05

$\leq x \leq 1.2$  and  $0 \leq y \leq 0.8$ , an anode having a layer of an anode active material and a non-aqueous electrolyte, wherein the layer of the cathode active material has a film thickness in a range from 25 to 110  $\mu\text{m}$ . If a layer of a cathode active material is provided on each surface of a cathode current collector, the sum of the film thicknesses of the layers of the cathode active material ranges between 50 and 220  $\mu\text{m}$ . The non-aqueous electrolyte may be a liquid-based electrolyte or a polymer electrolyte.

IT Ball milling

Battery cathodes

Secondary batteries

(nonaq. electrolyte secondary battery with compound of olivinic structure as cathode active material)

IT Carbon black, uses

RL: CPS (Chemical process); DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)

(nonaq. electrolyte secondary battery with compound of olivinic structure as cathode active material)

IT 10377-52-3, Lithium phosphate 13977-75-8, Phosphoric acid, iron(3+) salt (3:2)

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)

(nonaq. electrolyte secondary battery with compound of olivinic structure as cathode active material)

IT 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 7440-44-0, Carbon, uses 7782-42-5, Graphite, uses 15365-14-7, Iron lithium phosphate felipo4 21324-40-3, Lithium hexafluorophosphate 407606-22-8, Chromium iron lithium phosphate ( $\text{Cr}_0.0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4)$ ) 407606-24-0, Cobalt iron lithium phosphate ( $\text{Co}_0.0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4)$ ) 407606-26-2, Copper iron lithium phosphate ( $\text{Cu}_0.0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4)$ ) 407606-28-4, Aluminum iron lithium phosphate ( $\text{Al}_0.0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4)$ ) 407606-30-8, Gallium iron lithium phosphate ( $\text{Ga}_0.0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4)$ ) 407606-32-0, Boron iron lithium phosphate ( $\text{B}_0.0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4)$ ) 407606-36-4, Iron lithium nickel phosphate ( $\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Ni}_0.0.8(\text{PO}_4)$ ) 407606-39-7, Iron lithium vanadium phosphate ( $\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{V}_0.0.8(\text{PO}_4)$ ) 407606-42-2, Iron lithium molybdenum phosphate ( $\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Mo}_0.0.8(\text{PO}_4)$ ) 407606-44-4, Iron lithium titanium phosphate ( $\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Ti}_0.0.8(\text{PO}_4)$ ) 407606-47-7, Iron lithium zinc phosphate ( $\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Zn}_0.0.8(\text{PO}_4)$ ) 407606-49-9, Iron lithium magnesium phosphate ( $\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Mg}_0.0.8(\text{PO}_4)$ ) 407606-51-3, Iron lithium niobium phosphate ( $\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Nb}_0.0.8(\text{PO}_4)$ ) 407629-83-8 407629-87-2 407629-90-7 407629-95-2 407630-01-7 407630-05-1 407630-10-8 407630-14-2 407630-19-7 407630-25-5, Aluminum iron lithium phosphate ( $\text{Al}_0.7\text{Fe}_0.3\text{Li}(\text{PO}_4)$ ) 407630-29-9, Gallium iron lithium phosphate ( $\text{Ga}_0.7\text{Fe}_0.3\text{Li}(\text{PO}_4)$ ) 407630-35-7 407630-40-4, Boron iron lithium phosphate ( $\text{B}_0.75\text{Fe}_0.25\text{Li}(\text{PO}_4)$ ) 407630-46-0

RL: DEV (Device component use); USES (Uses)

(nonaq. electrolyte secondary battery with compound of olivinic structure as cathode active material)

IT 9011-17-0. Hexafluoropropylene-vinylidene fluoride copolymer  
 RL: DEV (Device component use); MOA (Modifier or additive use); USES  
 (Uses)  
 (nonaq. electrolyte secondary battery with compound of olivinic structure  
 as cathode active material)

IT 7439-93-2. Lithium, uses  
 RL: DEV (Device component use); PEP (Physical, engineering or chemical  
 process); PYP (Physical process); PROC (Process); USES (Uses)  
 (nonaq. electrolyte secondary battery with compound of olivinic structure  
 as cathode active material)

L2 ANSWER 19 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN  
 ACCESSION NUMBER: 2002:272912 CAPLUS  
 DOCUMENT NUMBER: 136:297398  
 TITLE: Cathode and anode materials for solid nonaqueous  
 electrolyte battery  
 INVENTOR(S): Takahashi, Kimio; Hosoya, Mamoru; Miyake, Masami  
 PATENT ASSIGNEE(S): Sony Corporation, Japan  
 SOURCE: Eur. Pat. Appl., 22 pp.  
 CODEN: EPXXDW  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1195835	A2	20020410	EP 2001-123773	20011004
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 2002117902	A2	20020419	JP 2000-306877	20001005
CN 1348231	A	20020508	CN 2001-138524	20010930
US 2003143465	A1	20030731	US 2001-969220	20011002
TW 522594	B	20030301	TW 2001-90124408	20011003

PRIORITY APPLN. INFO.: JP 2000-306877 A 20001005

AB A battery is not deteriorated in cell characteristics and maintains the  
 cell shape encapsulated in a laminate film even when overdischarged to a  
 cell voltage of 0 V. The cell includes a cathode containing a compound having  
 the formula  $\text{Li}_x\text{Fe}_1-y\text{M}_y\text{PO}_4$ , where M is at least one selected from the group  
 consisting of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb,  
 with  $0.05 \leq x \leq 1.2$  and  $0 \leq y \leq 0.8$ , an anode  
 and a solid electrolyte. A cell member comprised of the cathode and the  
 anode, layered together with the interposition of a solid electrolyte, is  
 encapsulated in a laminate film.

IT Battery anodes  
 Battery cathodes  
 Battery electrolytes  
 (cathode and anode materials for solid nonaq. electrolyte battery)

IT 7440-44-0. Carbon, uses 15365-14-7. Iron lithium phosphate felipo4  
 407606-22-8. Chromium iron lithium phosphate  $\text{CrO}-0.8\text{FeO} \cdot 0.2-1\text{LiO} \cdot 0.05-$

1.2(P04)) 407606-24-0, Cobalt iron lithium phosphate  
 (Co0-0.8Fe0.2-1Li0.05-1.2(P04)) 407606-26-2, Copper iron lithium  
 phosphate (Cu0-0.8Fe0.2-1Li0.05-1.2(P04)) 407606-28-4, Aluminum iron  
 lithium phosphate (Al0-0.8Fe0.2-1Li0.05-1.2(P04)) 407606-30-8, Gallium  
 iron lithium phosphate (Ga0-0.8Fe0.2-1Li0.05-1.2(P04)) 407606-32-0,  
 Boron iron lithium phosphate (B0-0.8Fe0.2-1Li0.05-1.2(P04)) 407606-34-2,  
 Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(P04))  
 407606-36-4, Iron lithium nickel phosphate (Fe0.2-1Li0.05-1.2Ni0-0.8(P04))  
 407606-39-7, Iron lithium vanadium phosphate (Fe0.2-1Li0.05-1.2V0-  
 0.8(P04)) 407606-42-2, Iron lithium molybdenum phosphate  
 (Fe0.2-1Li0.05-1.2Mo0-0.8(P04)) 407606-44-4, Iron lithium titanium  
 phosphate (Fe0.2-1Li0.05-1.2Ti0-0.8(P04)) 407606-47-7, Iron lithium zinc  
 phosphate (Fe0.2-1Li0.05-1.2Zn0-0.8(P04)) **407606-49-9**, Iron  
 lithium magnesium phosphate (Fe0.2-1Li0.05-1.2Mg0-0.8(P04)) 407606-51-3,  
 Iron lithium niobium phosphate (Fe0.2-1Li0.05-1.2Nb0-0.8(P04))  
 RL: DEV (Device component use); USES (Uses)

(cathode and anode materials for solid nonaq. electrolyte battery)  
 IT 7439-93-2, Lithium, uses  
 RL: DEV (Device component use); PEP (Physical, engineering or chemical  
 process); PYP (Physical process); PROC (Process); USES (Uses)  
 (cathode and anode materials for solid nonaq. electrolyte battery)

L2 ANSWER 20 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:272909 CAPLUS

DOCUMENT NUMBER: 136:297395

TITLE: Method for fabrication of cathode active material and  
 a nonaqueous electrolyte battery

INVENTOR(S): Hosoya, Mamoru; Fukushima, Yuzuru; Sakai, Hidecki;  
 Kuyama, Junji

PATENT ASSIGNEE(S): Sony Corporation, Japan

SOURCE: Eur. Pat. Appl., 31 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1195827	A2	20020410	EP 2001-123894	20011005
EP 1195827	A3	20040310		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 2002117848	A2	20020419	JP 2000-308300	20001006
JP 2002117849	A2	20020419	JP 2000-308313	20001006
US 2002124386	A1	20020912	US 2001-966918	20010928
TW 513822	B	20021211	TW 2001-90124109	20010928
CN 1360353	A	20020724	CN 2001-138169	20010930
PRIORITY APPLN. INFO.:			JP 2000-308300	A 20001006
			JP 2000-308313	A 20001006

AB The invention comprises a method for producing a cathode active material having superior cell characteristics through single-phase synthesis of a composite material composed of a compound represented by the general formula  $\text{Li}_x\text{Fe}_{1-y}\text{M}_y\text{PO}_4$  and a carbon material pos. and a method for producing a non-aqueous electrolyte cell employing the so produced cathode active material. To this end, the cathode active material is prepared by a step of mixing the starting materials for synthesis of the compound represented by the general formula  $\text{Li}_x\text{Fe}_{1-y}\text{M}_y\text{PO}_4$ , a step of milling a mixture obtained by the mixing step, a step of compressing the mixture obtained by the mixing step to a preset d. and a step of sintering the mixture obtained by the compressing step. A carbon material is added in any one of the above steps prior to the sintering step. The d. of the mixture in the compressing step is set to not less than 1.71 g/cm<sup>3</sup> and not larger than 2.45 g/cm<sup>3</sup>.

IT Ball milling

Battery cathodes

Composites

Secondary batteries

(method for fabrication of cathode active material and nonaq. electrolyte battery)

IT Carbon black, uses

RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)

(method for fabrication of cathode active material and nonaq. electrolyte battery)

IT 7440-44-0, Carbon, uses 198782-39-7, Iron lithium phosphate ( $\text{FeLiO}-1(\text{PO}_4)$ ) 407606-22-8, Chromium iron lithium phosphate ( $\text{CrO}-0.8\text{FeO}.2-1\text{LiO}.05-1.2(\text{PO}_4)$ ) 407606-24-0, Cobalt iron lithium phosphate ( $\text{CoO}-0.8\text{FeO}.2-1\text{LiO}.05-1.2(\text{PO}_4)$ ) 407606-26-2, Copper iron lithium phosphate ( $\text{CuO}-0.8\text{FeO}.2-1\text{LiO}.05-1.2(\text{PO}_4)$ ) 407606-28-4, Aluminum iron lithium phosphate ( $\text{AlO}-0.8\text{FeO}.2-1\text{LiO}.05-1.2(\text{PO}_4)$ ) 407606-30-8, Gallium iron lithium phosphate ( $\text{GaO}-0.8\text{FeO}.2-1\text{LiO}.05-1.2(\text{PO}_4)$ ) 407606-32-0, Boron iron lithium phosphate ( $\text{BO}-0.8\text{FeO}.2-1\text{LiO}.05-1.2(\text{PO}_4)$ ) 407606-34-2, Iron lithium manganese phosphate ( $\text{FeO}.2-1\text{LiO}.05-1.2\text{MnO}-0.8(\text{PO}_4)$ ) 407606-36-4, Iron lithium nickel phosphate ( $\text{FeO}.2-1\text{LiO}.05-1.2\text{NiO}-0.8(\text{PO}_4)$ ) 407606-39-7, Iron lithium vanadium phosphate ( $\text{FeO}.2-1\text{LiO}.05-1.2\text{VO}-0.8(\text{PO}_4)$ ) 407606-42-2, Iron lithium molybdenum phosphate ( $\text{FeO}.2-1\text{LiO}.05-1.2\text{MoO}-0.8(\text{PO}_4)$ ) 407606-44-4, Iron lithium titanium phosphate ( $\text{FeO}.2-1\text{LiO}.05-1.2\text{TiO}-0.8(\text{PO}_4)$ ) 407606-47-7, Iron lithium zinc phosphate ( $\text{FeO}.2-1\text{LiO}.05-1.2\text{ZnO}-0.8(\text{PO}_4)$ ) 407606-49-9, Iron lithium magnesium phosphate ( $\text{FeO}.2-1\text{LiO}.05-1.2\text{MgO}-0.8(\text{PO}_4)$ ) 407606-51-3, Iron lithium niobium phosphate ( $\text{FeO}.2-1\text{LiO}.05-1.2\text{NbO}-0.8(\text{PO}_4)$ ) 407629-87-2 407629-90-7 407629-95-2 407630-01-7 407630-10-8 407630-14-2

RL: DEV (Device component use); USES (Uses)

(method for fabrication of cathode active material and nonaq. electrolyte battery)

IT 15365-14-7P, Iron lithium phosphate  $\text{FeLiPO}_4$

RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(method for fabrication of cathode active material and nonaq.

electrolyte battery)  
 IT 9011-17-0. Hexafluoropropylene-vinylidene fluoride copolymer  
 RL: MOA (Modifier or additive use); USES (Uses)  
 (method for fabrication of cathode active material and nonaq:  
 electrolyte battery)

L2 ANSWER 21 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:272908 CAPLUS  
 DOCUMENT NUMBER: 136:297394  
 TITLE: Solid electrolyte cell  
 INVENTOR(S): Goto, Shuji; Hosoya, Mamoru; Endo, Takahiro  
 PATENT ASSIGNEE(S): Sony Corporation; Japan  
 SOURCE: Eur. Pat. Appl., 16 pp.  
 CODEN: EPXXDW  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1195826	A2	20020410	EP 2001-123774	20011004
EP 1195826	A3	20031126		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 2002117844	A2	20020419	JP 2000-306876	20001005
US 2002094481	A1	20020718	US 2001-966864	20010928
TW 523952	B	20030311	TW 2001-90124127	20010928
CN 1349273	A	20020515	CN 2001-139323	20010930

PRIORITY APPLN. INFO.: JP 2000-306876 A 20001005

AB A solid electrolyte cell in which cell characteristics are not deteriorated even on overdischarge to the cell voltage of 0 V, such that the shape of the cell encapsulated in the laminate film is maintained. The cell includes a cathode containing a compound represented by the general formula  $\text{Li}_x\text{Fe}_{1-y}\text{M}_y\text{PO}_4$  where  $0.05 \leq x \leq 1.2$ ,  $0 \leq y \leq 0.8$ , and M is at least one selected from the group consisting of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb, an anode and a solid electrolyte. An electrode unit 1 comprised of the cathode and the anode layered together with interposition of the solid electrolyte is encapsulated with a laminate film 2.

IT Polyoxyalkylenes, uses  
 RL: DEV (Device component use); USES (Uses)  
 (lithium complex; solid electrolyte cell)

IT Battery cathodes  
 Secondary batteries  
 (solid electrolyte cell)

IT Fluoropolymers, uses  
 RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)  
 (solid electrolyte cell)

IT 7439-93-2D, Lithium, polyethylene oxide complex 7791-03-9, Lithium perchlorate 12031-65-1, Lithium nickel oxide  $\text{LiNiO}_2$  12057-17-9, Lithium manganese oxide  $\text{LiMn}_2\text{O}_4$  15365-14-7, Iron lithium phosphate  $\text{FeLiPO}_4$  25322-68-3D, Polyethylene oxide, lithium complex 116327-69-6, Cobalt lithium nickel oxide  $\text{Co}_0.1\text{LiNi}_0.9\text{O}_2$  147812-18-8, Iron lithium manganese oxide  $\text{Fe}_0.05\text{LiMn}_1.95\text{O}_4$  407606-22-8, Chromium iron lithium phosphate  $(\text{Cr}_0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4))$  407606-24-0, Cobalt iron lithium phosphate  $(\text{Co}_0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4))$  407606-26-2, Copper iron lithium phosphate  $(\text{Cu}_0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4))$  407606-28-4, Aluminum iron lithium phosphate  $(\text{Al}_0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4))$  407606-30-8, Gallium iron lithium phosphate  $(\text{Ga}_0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4))$  407606-32-0, Boron iron lithium phosphate  $(\text{B}_0.8\text{Fe}_0.2-1\text{Li}_0.05-1.2(\text{PO}_4))$  407606-34-2, Iron lithium manganese phosphate  $(\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Mn}_0.8(\text{PO}_4))$  407606-36-4, Iron lithium nickel phosphate  $(\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Ni}_0.8(\text{PO}_4))$  407606-39-7, Iron lithium vanadium phosphate  $(\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{V}_0.8(\text{PO}_4))$  407606-42-2, Iron lithium molybdenum phosphate  $(\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Mo}_0.8(\text{PO}_4))$  407606-44-4, Iron lithium titanium phosphate  $(\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Ti}_0.8(\text{PO}_4))$  407606-47-7, Iron lithium zinc phosphate  $(\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Zn}_0.8(\text{PO}_4))$  **407606-49-9**, Iron lithium magnesium phosphate  $(\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Mg}_0.8(\text{PO}_4))$  407606-51-3, Iron lithium niobium phosphate  $(\text{Fe}_0.2-1\text{Li}_0.05-1.2\text{Nb}_0.8(\text{PO}_4))$  408331-94-2, Cobalt lithium nickel oxide  $((\text{Co},\text{Ni})\text{LiO}-2\text{O}_2)$  408331-95-3, Cobalt lithium manganese oxide  $((\text{Co},\text{Mn})\text{LiO}-2\text{O}_2)$  408331-96-4, Cobalt lithium zinc oxide  $((\text{Co},\text{Zn})\text{LiO}-2\text{O}_2)$  408331-97-5, Cobalt lithium tin oxide  $((\text{Co},\text{Sn})\text{LiO}-2\text{O}_2)$  408331-99-7, Cobalt lithium vanadium oxide  $((\text{Co},\text{V})\text{LiO}-2\text{O}_2)$  408332-00-3, Cobalt lithium titanium oxide  $((\text{Co},\text{Ti})\text{LiO}-2\text{O}_2)$  408332-01-4, Cobalt lithium molybdenum oxide  $((\text{Co},\text{Mo})\text{LiO}-2\text{O}_2)$  408332-02-5, Cobalt lithium tungsten oxide  $((\text{Co},\text{W})\text{LiO}-2\text{O}_2)$  408332-03-6, Cobalt lithium magnesium oxide  $((\text{Co},\text{Mg})\text{LiO}-2\text{O}_2)$  408332-04-7, Cobalt lithium strontium oxide  $((\text{Co},\text{Sr})\text{LiO}-2\text{O}_2)$  408332-05-8, Cobalt lithium niobium oxide  $((\text{Co},\text{Nb})\text{LiO}-2\text{O}_2)$  408332-06-9, Cobalt iron lithium oxide  $((\text{Co},\text{Fe})\text{LiO}-2\text{O}_2)$  408332-07-0, Cobalt copper lithium oxide  $((\text{Co},\text{Cu})\text{LiO}-2\text{O}_2)$  408332-08-1, Aluminum cobalt lithium oxide  $((\text{Al},\text{Co})\text{LiO}-2\text{O}_2)$  408332-09-2, Cobalt lithium borate oxide  $(\text{Co}_0.1\text{LiO}-2(\text{BO}_2)_0.9\text{O}-2)$  408332-10-5, Cobalt gallium lithium oxide  $((\text{Co},\text{Ga})\text{LiO}-2\text{O}_2)$  408332-11-6, Chromium cobalt lithium oxide  $((\text{Cr},\text{Co})\text{LiO}-2\text{O}_2)$  408332-12-7, Calcium cobalt lithium oxide  $((\text{Ca},\text{Co})\text{LiO}-2\text{O}_2)$  408332-13-8, Iron lithium nickel oxide  $((\text{Fe},\text{Ni})\text{LiO}-2\text{O}_2)$  408332-14-9, Copper lithium nickel oxide  $((\text{Cu},\text{Ni})\text{LiO}-2\text{O}_2)$  408332-15-0, Aluminum lithium nickel oxide  $((\text{Al},\text{Ni})\text{LiO}-2\text{O}_2)$  408332-16-1, Lithium nickel borate oxide  $(\text{LiO}-2\text{NiO}-1(\text{BO}_2)_0.9\text{O}-2)$  408332-17-2, Gallium lithium nickel oxide  $((\text{Ga},\text{Ni})\text{LiO}-2\text{O}_2)$  408332-18-3, Chromium lithium nickel oxide  $((\text{Cr},\text{Ni})\text{LiO}-2\text{O}_2)$  408332-19-4, Calcium lithium nickel oxide  $((\text{Ca},\text{Ni})\text{LiO}-2\text{O}_2)$  408332-20-7, Lithium manganese nickel oxide  $(\text{LiO}-2(\text{Mn},\text{Ni})\text{O}_2)$  408332-21-8, Lithium nickel zinc oxide  $(\text{LiO}-2(\text{Ni},\text{Zn})\text{O}_2)$  408332-22-9, Lithium nickel tin oxide  $(\text{LiO}-2(\text{Ni},\text{Sn})\text{O}_2)$  408332-23-0, Lithium nickel vanadium oxide  $(\text{LiO}-2(\text{Ni},\text{V})\text{O}_2)$  408332-24-1, Lithium nickel titanium oxide  $(\text{LiO}-2(\text{Ni},\text{Ti})\text{O}_2)$  408332-25-2, Lithium nickel tungsten oxide  $(\text{LiO}-2(\text{Ni},\text{W})\text{O}_2)$  408332-26-3, Lithium molybdenum nickel oxide  $(\text{LiO}-2(\text{Mo},\text{Ni})\text{O}_2)$  408332-27-4, Lithium magnesium nickel oxide



(LiO-2(Mg,Ni)O2) 408332-28-5, Lithium nickel strontium oxide  
 (LiO-2(Ni,Sr)O2) 408332-29-6, Lithium nickel niobium oxide  
 (LiO-2(Ni,Nb)O2) 408332-30-9, Lithium manganese nickel oxide  
 (LiO-2(Mn,Ni)O2) 408332-31-0, Lithium manganese zinc oxide  
 (LiO-2(Mn,Zn)O2) 408332-32-1, Lithium manganese tin oxide  
 (LiO-2(Mn,Sn)O2) 408332-33-2, Lithium manganese vanadium oxide  
 (LiO-2(Mn,V)O2) 408332-34-3, Lithium manganese titanium oxide  
 (LiO-2(Mn,Ti)O2) 408332-35-4, Lithium manganese molybdenum oxide  
 (LiO-2(Mn,Mo)O2) 408332-36-5, Lithium manganese tungsten oxide  
 (LiO-2(Mn,W)O2) 408332-37-6, Lithium magnesium manganese oxide  
 (LiO-2(Mg,Mn)O2) 408332-38-7, Lithium manganese strontium oxide  
 (LiO-2(Mn,Sr)O2) 408332-39-8, Lithium manganese niobium oxide  
 (LiO-2(Mn,Nb)O2) 408332-40-1, Iron lithium manganese oxide  
 ((Fe,Mn)2LiO-2O4) 408332-42-3, Cobalt lithium manganese oxide  
 ((Co,Mn)2LiO-2O4) 408332-44-5, Aluminum lithium manganese oxide  
 ((Al,Mn)2LiO-2O4) 408332-45-6, Lithium manganese borate oxide  
 (LiO-2MnO-2(BO2)O-200-4) 408332-46-7, Gallium lithium manganese oxide  
 ((Ga,Mn)2LiO-2O4) 408332-47-8, Chromium lithium manganese oxide  
 ((Cr,Mn)2LiO-2O4) 408332-48-9, Calcium lithium manganese oxide  
 ((Ca,Mn)2LiO-2O4) 408332-58-1, Aluminum cobalt lithium nickel oxide  
 (Al0.01Co0.98LiNi0.01O2) 412351-36-1, Iron lithium manganese phosphate  
 (Fe0.9LiMn0.1(PO4))

RL: DEV (Device component use); USES (Uses)  
 (solid electrolyte cell)

IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate 7782-42-5,  
 Graphite, uses 12190-79-3, Cobalt lithium oxide colio2 21324-40-3,  
 Lithium hexafluorophosphate 24937-79-9, PvdF

RL: DEV (Device component use); MOA (Modifier or additive use); USES  
 (Uses)

(solid electrolyte cell)

L2 ANSWER 22 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:256757 CAPLUS

DOCUMENT NUMBER: 136:282003

TITLE: Lithium-based cathode active materials for  
 rechargeable lithium battery and preparation thereof

INVENTOR(S): Barker, Jeremy; Saidi, M. Yazid; Swoyer, Jeffrey L.

PATENT ASSIGNEE(S): UK

SOURCE: U.S. Pat. Appl. Publ., 39 pp., Cont.-in-part of U. S.  
 Ser. No. 484,799.

CODEN: USXXCO

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2002039687	A1	20020404	US 2001-908480	20010718
US 2003129492	A1	20030710	US 2000-484799	20000118

WO 2001054212 A1 20010726 WO 2000-US35302 20001222  
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN,  
CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR,  
HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT,  
LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU,  
SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN,  
YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM  
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY,  
DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF,  
BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG  
EP 1309021 A2 20030507 EP 2003-2687 20001222  
EP 1309021 A3 20030903  
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,  
IE, LT, LV, FI, RO, MK, CY, AL, TR  
JP 2003223893 A2 20030808 JP 2002-362497 20001222  
PRIORITY APPLN. INFO.: US 2000-484799 A2 20000118  
WO 2000-US35302 W 20001222  
EP 2000-993800 A3 20001222  
JP 2001-553602 A3 20001222  
AB The invention provides novel lithium-mixed metal materials which, upon  
electrochem. interaction, release lithium ions, and are capable of  
reversibly cycling lithium ions. The invention provides a rechargeable  
lithium battery which comprises an electrode formed from the novel  
lithium-mixed metal materials. Methods for making the novel lithium-mixed  
metal materials and methods for using such lithium-mixed metal materials  
in electrochem. cells are also provided. The lithium-mixed metal  
materials comprise lithium and at least one other metal besides lithium.  
Preferred materials are lithium-mixed metal phosphates which contain  
lithium and two other metals besides lithium.  
IT Battery cathodes  
(lithium-based cathode active materials for rechargeable lithium  
battery and preparation thereof)  
IT Olivine-group minerals  
RL: DEV (Device component use); USES (Uses)  
(lithium-based cathode active materials for rechargeable lithium  
battery and preparation thereof)  
IT Secondary batteries  
(lithium; lithium-based cathode active materials for rechargeable  
lithium battery and preparation thereof)  
IT 405914-52-5, Cobalt lithium magnesium phosphate ((Co,Mg)Li(P04))  
405914-53-6, Cobalt lithium magnesium phosphate (Co0.9LiMg0.1(P04))  
405914-58-1, Cobalt lithium magnesium phosphate (Co0.95LiMg0.05(P04))  
405914-63-8 405914-68-3, Calcium cobalt lithium phosphate  
((Ca,Co)Li(P04)) 405914-73-0, Calcium cobalt lithium phosphate  
(Ca0.1Co0.9Li(P04)) 405914-83-2, Cobalt lithium zinc phosphate  
((Co,Zn)Li(P04)) 405914-88-7, Cobalt lithium zinc phosphate  
(Co0.9LiZn0.1(P04)) 405914-93-4, Cobalt lithium strontium phosphate  
((Co,Sr)Li(P04)) 405914-98-9, Cobalt lead lithium phosphate  
((Co,Pb)Li(P04)) 405915-04-0, Cadmium cobalt lithium phosphate  
((Cd,Co)Li(P04)) 405915-09-5, Cobalt lithium tin phosphate

((Co.Sn)Li(P04)) 405915-14-2, Barium cobalt lithium phosphate  
((Ba.Co)Li(P04)) 405915-21-1, Beryllium cobalt lithium phosphate  
((Be.Co)Li(P04)) 405915-29-9, Cobalt lithium magnesium phosphate  
(Co0.5-1LiMg0-0.5(P04)) 405915-34-6, Cobalt lithium magnesium phosphate  
(Co0.8-1LiMg0-0.2(P04)) 405915-39-1, Calcium cobalt lithium phosphate  
(Ca0-0.5Co0.5-1Li(P04)) 405915-44-8, Calcium cobalt lithium phosphate  
(Ca0-0.2Co0.8-1Li(P04)) 405915-48-2, Cobalt lithium zinc phosphate  
(Co0.5-1LiZn0-0.5(P04)) 405915-51-7, Cobalt lithium zinc phosphate  
(Co0.8-1LiZn0-0.2(P04)) 405915-56-2, Cobalt lithium strontium phosphate  
(Co0.5-1LiSr0-0.5(P04)) 405915-59-5, Cobalt lithium strontium phosphate  
(Co0.8-1LiSr0-0.2(P04)) 405915-63-1, Cobalt lead lithium phosphate  
(Co0.5-1Pb0-0.5Li(P04)) 405915-66-4, Cobalt lead lithium phosphate  
(Co0.8-1Pb0-0.2Li(P04)) 405915-69-7, Cadmium cobalt lithium phosphate  
(Cd0-0.5Co0.5-1Li(P04)) 405915-79-9, Cadmium cobalt lithium phosphate  
(Cd0-0.2Co0.8-1Li(P04)) 405915-82-4, Cobalt lithium tin phosphate  
(Co0.8-1LiSn0-0.2(P04)) 405915-85-7, Cobalt lithium tin phosphate  
(Co0.95-1LiSn0-0.05(P04)) 405915-88-0, Cobalt lithium tin phosphate  
(Co0.5-1LiSn0-0.5(P04)) 405915-90-4, Barium cobalt lithium phosphate  
(Ba0-0.5Co0.5-1Li(P04)) 405915-92-6, Barium cobalt lithium phosphate  
(Ba0-0.2Co0.8-1Li(P04)) 405915-94-8, Beryllium cobalt lithium phosphate  
(Be0-0.5Co0.5-1Li(P04)) 405915-96-0, Beryllium cobalt lithium phosphate  
(Be0-0.2Co0.8-1Li(P04))

RL: DEV (Device component use); USES (Uses)

(lithium-based cathode active materials for rechargeable lithium battery and preparation thereof)

IT 84159-18-2P, Lithium vanadium phosphate  $\text{Li}_3\text{V}_2(\text{P}_04)_3$  349632-76-4P  
, Iron lithium magnesium phosphate ( $\text{Fe}_0.9\text{LiMg}_0.1(\text{P}_04)$ ) 349632-79-7P,  
Calcium iron lithium phosphate ( $\text{Ca}_0.1\text{Fe}_0.9\text{Li}(\text{P}_04)$ ) 349632-82-2P, Iron  
lithium zinc phosphate ( $\text{Fe}_0.9\text{LiZn}_0.1(\text{P}_04)$ )

RL: DEV (Device component use); SPN (Synthetic preparation); PREP  
(Preparation); USES (Uses)

(lithium-based cathode active materials for rechargeable lithium battery and preparation thereof)

○ L2 ANSWER 23 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:256645 CAPLUS

DOCUMENT NUMBER: 136:297382

TITLE: Carbon-coated or carbon-crosslinked redox materials  
with transition metal-lithium oxide core for use as  
battery electrodes

INVENTOR(S): Armand, Michel; Gauthier, Michel; Magnan,  
Jean-Francois; Ravet, Nathalie

PATENT ASSIGNEE(S): Hydro-Quebec, Can.

SOURCE: PCT Int. Appl., 78 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: French

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002027824	A1	20020404	WO 2001-CA1350	20010921
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
AU 2001093569	A5	20020408	AU 2001-93569	20010921
EP 1325526	A1	20030709	EP 2001-973907	20010921
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR				
PRIORITY APPLN. INFO.:				
CA 2000-2320661 A 20000926				
WO 2001-CA1350 W 20010921				
AB	Carbon-coated redox materials suitable for use in battery electrodes consist of a core surrounded by a coating, or interconnected by carbon crosslinks, in which the core includes a composition of formula $LixM1-yM'y(XO4)n$ , in which $y = 0-0.6$ , $x = 0-2$ , $n = 0-1.5$ ; M is a transition metal; and M' is a element of fixed valence selected from $Mg^{2+}$ , $Ca^{2+}$ , $Al^{3+}$ , and $Zn^{2+}$ , and X is S, P, and Si. Synthesis of the materials is carried out by reacting a balanced mixture of appropriate precursors in a reducing atmospheric, to adjust the valence of the transition metals, in the presence of a carbon source, which is then pyrolyzed. The resulting products exhibit an excellent elec. conductivity and a highly enhanced chemical activity.			
IT	Silanes RL: RCT (Reactant); RACT (Reactant or reagent) (alkoxy, silicon source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)			
IT	Polyoxyalkylenes, uses RL: NUU (Other use, unclassified); USES (Uses) (alkyl ethers, oligomeric, aprotic solvent; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)			
IT	Fluoropolymers, uses Polyesters, uses Polyethers, uses RL: NUU (Other use, unclassified); USES (Uses) (binders; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)			
IT	Battery cathodes Battery electrodes Redox agents (carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)			

- IT Transition metals, uses  
 RL: TEM (Technical or engineered material use); USES (Uses)  
 (electrodes containing; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)
- IT 78-93-3, Methyl ethyl ketone, uses 96-48-0, Butyrolactone 96-49-1, Ethylene carbonate 107-21-1D, Ethylene glycol, alkyl ethers 108-32-7, Propylene carbonate 111-46-6D, Diethylene glycol, alkyl ethers 112-27-6D, Triethylene glycol, alkyl ethers 112-60-7D, Tetraethylene glycol, alkyl ethers 463-79-6D, Carbonic acid, C1-4-alkyl esters  
 RL: NUU (Other use, unclassified); USES (Uses)  
 (aprotic solvent; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)
- IT 9011-14-7, Poly(methyl methacrylate) 24937-79-9, Poly(vinylidene difluoride) 25014-41-9, Polyacrylonitrile  
 RL: NUU (Other use, unclassified); USES (Uses)  
 (binders; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)
- IT 50-99-7, Glucose, reactions 57-48-7, Fructose, reactions 57-50-1, Sucrose, reactions 58-86-6, Xylose, reactions 87-79-6, Sorbose 9002-88-4, Polyethylene 9003-07-0, Polypropylene 9004-34-6, Cellulose, reactions 9004-34-6D, Cellulose, esters 9004-35-7, Cellulose acetate 9005-25-8, Starch, reactions 25212-86-6, Poly(furfuryl alcohol) 43094-71-9, Ethylene-ethylene oxide copolymer  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (carbon source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)
- IT 407640-63-5, Iron lithium titanium phosphate sulfate ( $\text{Fe}_{0.85}\text{Li}_{1.35}\text{Ti}_{0.15}(\text{PO}_4)_0.5(\text{SO}_4)$ )  
 RL: DEV (Device component use); USES (Uses)  
 (electrodes containing; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)
- IT 7439-89-6D, Iron, mixed oxides 7439-96-5D, Manganese, mixed oxides 7440-02-0D, Nickel, mixed oxides 7440-32-6D, Titanium, mixed oxides 7440-47-3D, Chromium, mixed oxides 7440-48-4D, Cobalt, mixed oxides 7440-50-8D, Copper, mixed oxides 7440-62-2D, Vanadium, mixed oxides 13816-45-0, Triphylite 15365-14-7, Iron lithium phosphate ( $\text{FeLiPO}_4$ ) 213467-46-0, Iron lithium manganese phosphate ( $\text{FeLi}_2\text{Mn}(\text{PO}_4)_2$ )  
 RL: TEM (Technical or engineered material use); USES (Uses)  
 (electrodes containing; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)
- IT 90076-65-6  
 RL: NUU (Other use, unclassified); USES (Uses)  
 (electrolyte containing; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)
- IT 516-03-0, Ferrous oxalate  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (iron source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)
- IT 7429-90-5, Aluminum, uses 7440-31-5, Tin, uses 7440-36-0, Antimony,

uses 7440-66-6, Zinc, uses 7782-42-5, Graphite, uses 39302-37-9, Lithium titanate 207803-50-7, Aluminum cobalt lithium magnesium nickel oxide 258511-24-9, Iron lithium nitride 263898-18-6, Cobalt manganese nitride 407640-62-4

RL: DEV (Device component use); USES (Uses)

(lithium-based cathodes containing; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)

IT 638-38-0, Manganese(II) acetate

RL: RCT (Reactant); RACT (Reactant or reagent)

(manganese source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)

IT 546-89-4, Lithium acetate 553-91-3, Lithium oxalate 554-13-2, Lithium carbonate 1309-37-1, Ferric oxide, reactions 1310-65-2, Lithium hydroxide 1313-13-9, Manganese dioxide, reactions 1314-62-1, Vanadium pentoxide, reactions 1317-61-9, Magnetite, reactions 10045-86-0, Ferric phosphate 10102-24-6, Lithium silicate ( $\text{Li}_2\text{SiO}_3$ ) 10377-48-7, Lithium sulfate 10377-52-3, Lithium phosphate ( $\text{Li}_3\text{PO}_4$ ) 10421-48-4, Ferric nitrate 12057-24-8, Lithium oxide, reactions 12627-14-4 13453-80-0, Lithium dihydrogen phosphate 63985-45-5, Lithium orthosilicate 407640-52-2, Iron lithium manganese phosphate ( $\text{Fe}_{0.1}\text{LiMn}_{0.9}(\text{PO}_4)$ ) 407640-53-3, Iron lithium magnesium phosphate ( $\text{Fe}_{0.7}\text{LiMg}_{0.3}(\text{PO}_4)$ ) 407640-54-4, Calcium iron lithium phosphate ( $\text{Ca}_{0.3}\text{Fe}_{0.7}\text{Li}(\text{PO}_4)$ ) 407640-55-5 407640-56-6, Iron lithium phosphate silicate ( $\text{FeLi}_{1.9}(\text{PO}_4)_0.1(\text{SiO}_4)_0.9$ ) 407640-57-7 407640-58-8, Iron lithium manganese phosphate sulfate ( $\text{Fe}_{0.1}\text{Li}_{1.2}\text{Mn}_{0.2}[(\text{PO}_4)_2(\text{SO}_4)]$ ) 407640-59-9, Iron lithium manganese phosphate ((Fe,Mn)Li<sub>1.6</sub>(PO<sub>4</sub>)) 407640-60-2, Iron lithium manganese phosphate sulfate ( $\text{Fe}_{1.2}\text{Li}_{1.2}\text{Mn}_{0.1}[(\text{PO}_4)_2(\text{SO}_4)]$ ) 407640-61-3, Iron lithium titanium phosphate ((Fe,Ti)Li<sub>0.5</sub>-2(PO<sub>4</sub>)1.5)

RL: RCT (Reactant); RACT (Reactant or reagent)

(metal source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)

IT 25322-68-3D, Polyethylene glycol, alkyl ethers

RL: NUU (Other use, unclassified); USES (Uses)

(oligomeric, aprotic solvent; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)

IT 7664-38-2, Phosphoric acid, reactions 7664-38-2D, Phosphoric acid, esters 7783-28-0, Ammonium hydrogen phosphate 10124-54-6, Manganese phosphate

RL: RCT (Reactant); RACT (Reactant or reagent)

(phosphorus source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)

IT 7631-86-9, Silica, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)

(silicon source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as battery electrodes)

IT 7664-93-9, Sulfuric acid, reactions 7783-20-2, Ammonium sulfate, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)

(sulfur source; carbon-coated or carbon-crosslinked redox materials

with transition metal-lithium oxide core for use as battery electrodes)

REFERENCE COUNT: 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

○ L2 ANSWER 24 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2002:9172 CAPLUS

DOCUMENT NUMBER: 136:225905

TITLE: Clustering of Fe<sup>3+</sup> in the Li<sub>1-3x</sub>Fe<sub>x</sub>MgPO<sub>4</sub> (0<x<0.1)  
solid solution

AUTHOR(S): Goni, Aintzane; Lezama, Luis; Pujana, Ainhoa;  
Arriortua, Maria Isabel; Rojo, Teofilo

CORPORATE SOURCE: Universidad del Pais Vasco, Departamento Quimica  
Inorganica, Bilbao, 48080, Spain

SOURCE: International Journal of Inorganic Materials (2001),  
3(7), 937-942

CODEN: IJIMCR; ISSN: 1466-6049

PUBLISHER: Elsevier Science Ltd.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The Li<sub>1-3x</sub>Fe<sub>x</sub>MgPO<sub>4</sub> (0<x<0.1) solid solution was prepared by solid state synthesis. The structure of these phases was determined by x-ray diffraction on polycryst. samples, being isostructural with LiMgPO<sub>4</sub>. Fe<sup>3+</sup> substitutes part of the Li<sup>+</sup> ions in the channels of the LiMgPO<sub>4</sub> structure along the [010] direction, creating cation vacancies. The IR bands corresponding to the vibrational modes of the phosphate groups undergo a gradual widening with the amount of inserted iron as a consequence of the increase of disorder in the structure. The EPR spectra show signals with an effective g' = 4.0. This fact can be attributed to the presence of high spin Fe<sup>3+</sup> ions in orthorhombic symmetry. The increase of Fe<sup>3+</sup> in the compds. leads to a broadening of the Lorentzian EPR signals indicating the existence of magnetic interactions between the Fe<sup>3+</sup> ions. Magnetic susceptibility measurements on the Li<sub>1-3x</sub>Fe<sub>x</sub>MgPO<sub>4</sub> (0<x<0.1) solid solution show antiferromagnetic behaviors which can be explained considering that the doped Fe<sup>3+</sup> ions exhibit a short range magnetic order, forming clusters associated with the vacancies in the structure.

IT Antiferromagnetic ordering

Crystal structure

ESR (electron spin resonance)

Magnetic susceptibility

Molecular structure

(of lithium iron magnesium phosphate (Li<sub>1-3x</sub>Fe<sub>x</sub>MgPO<sub>4</sub> (0<x<0.1)) solid  
solution containing Fe<sup>3+</sup> clusters associated with vacancies)

IT 210709-38-9P, Iron lithium magnesium phosphate (Fe<sub>0.03</sub>Li<sub>0.9</sub>MgPO<sub>4</sub>)

210709-40-3P, Iron lithium magnesium phosphate (Fe<sub>0.1</sub>Li<sub>0.7</sub>MgPO<sub>4</sub>)

402519-34-0P, Iron lithium magnesium phosphate

(Fe<sub>0-0.1</sub>Li<sub>0.7-1</sub>Mg(PO<sub>4</sub>)) 402519-35-1P, Iron lithium magnesium  
phosphate (Fe<sub>0.07</sub>Li<sub>0.8</sub>Mg(PO<sub>4</sub>))

RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)

(preparation, crystal structure, ESR and magnetic properties)  
 IT 1310-65-2, Lithium hydroxide (LiOH) 7722-76-1, Monoammonium phosphate  
 10377-60-3 10421-48-4, Iron nitrate (Fe(NO<sub>3</sub>)<sub>3</sub>)  
 RL: RCT (Reactant); RACT (Reactant or reagent)  
 (reactant for preparation of lithium iron magnesium phosphate  
 (Li<sub>1-3</sub>xFe<sub>x</sub>MgPO<sub>4</sub> (0<x<0.1)) solid solution containing Fe<sup>3+</sup> clusters associated  
 with vacancies)  
 REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS  
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

○ L2 ANSWER 25 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN  
 ACCESSION NUMBER: 2001:546025 CAPLUS  
 DOCUMENT NUMBER: 135:109741  
 TITLE: Preparation of lithium-based electrochemically active  
 materials for lithium batteries  
 INVENTOR(S): Barker, Jeremy; Saidi, M. Yazid  
 PATENT ASSIGNEE(S): Valence Technology, Inc., USA  
 SOURCE: PCT Int. Appl., 97 pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 2  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2001054212	A1	20010726	WO 2000-US35302	20001222
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
US 2003129492	A1	20030710	US 2000-484799	20000118
EP 1252671	A1	20021030	EP 2000-993800	20001222
EP 1252671	B1	20040303		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR				
EP 1309021	A2	20030507	EP 2003-2687	20001222
EP 1309021	A3	20030903		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, LT, LV, FI, RO, MK, CY, AL, TR				
JP 2003520182	T2	20030702	JP 2001-553602	20001222
JP 2003223893	A2	20030808	JP 2002-362497	20001222
US 2002039687	A1	20020404	US 2001-908480	20010718
US 2003077514	A1	20030424	US 2002-304890	20021125
PRIORITY APPLN. INFO.:			US 2000-484799	A1 20000118



EP 2000-993800 A3 20001222  
JP 2001-553602 A3 20001222  
WO 2000-US35302 W 20001222

- AB The invention provides novel lithium-mixed metal materials which, upon electrochem. interaction, release lithium ions, and are capable of reversibly cycling lithium ions. The invention provides a rechargeable lithium battery which comprises an electrode formed from the novel lithium-mixed metal materials. Methods for making the novel lithium-mixed metal materials and methods for using such lithium-mixed metal materials in electrochem. cells are also provided. The lithium-mixed metal materials comprise lithium and at least one other metal besides lithium. Preferred materials are lithium-mixed metal phosphates which contain lithium and two other metals besides lithium.
- IT Secondary batteries  
(lithium; preparation of lithium-based electrochem. active materials for lithium batteries)
- IT Battery cathodes  
(preparation of lithium-based electrochem. active materials for lithium batteries)
- IT Carbon black, uses  
RL: MOA (Modifier or additive use); USES (Uses)  
(preparation of lithium-based electrochem. active materials for lithium batteries)
- IT EPDM rubber  
RL: TEM (Technical or engineered material use); USES (Uses)  
(preparation of lithium-based electrochem. active materials for lithium batteries)
- IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate 7439-93-2, Lithium, uses 12162-92-4, lithium vanadium oxide  $\text{LiV}_2\text{O}_5$  21324-40-3, Lithium hexafluorophosphate  
RL: DEV (Device component use); USES (Uses)  
(preparation of lithium-based electrochem. active materials for lithium batteries)
- IT 331622-65-2P, Iron lithium zinc phosphate ( $\text{Fe}_{0.8}\text{LiZn}_{0.2}(\text{PO}_4)$ )  
**349632-76-4P**, Iron lithium magnesium phosphate ( $\text{Fe}_{0.9}\text{LiMg}_{0.1}(\text{PO}_4)$ )  
349632-79-7P, Calcium iron lithium phosphate ( $\text{Ca}_{0.1}\text{Fe}_{0.9}\text{Li}(\text{PO}_4)$ )  
349632-82-2P, Iron lithium zinc phosphate ( $\text{Fe}_{0.9}\text{LiZn}_{0.1}(\text{PO}_4)$ )  
**349632-85-5P** 349632-88-8P  
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)  
(preparation of lithium-based electrochem. active materials for lithium batteries)
- IT 554-13-2, Lithium carbonate 1305-62-0, Calcium hydroxide, reactions 1309-37-1, Ferric oxide, reactions 1309-42-8, Magnesium hydroxide 7440-44-0, Carbon, reactions 7779-90-0, Zinc phosphate 7783-28-0, Diammonium hydrogen phosphate 10045-86-0, iron phosphate  $\text{FePO}_4$  13453-80-0, Lithium dihydrogen phosphate 14940-41-1, Iron phosphate  $\text{Fe}_3(\text{PO}_4)_2$   
RL: RCT (Reactant); RACT (Reactant or reagent)  
(preparation of lithium-based electrochem. active materials for lithium

batteries)  
 IT 15365-14-7P, iron lithium phosphate felipo4 84159-18-2P, Lithium  
 vanadium phosphate Li3V2(PO4)3  
 RL: SPN (Synthetic preparation); PREP (Preparation)  
 (preparation of lithium-based electrochem. active materials for lithium  
 batteries)  
 REFERENCE COUNT: 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS  
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 26 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN  
 ACCESSION NUMBER: 2001:545615 CAPLUS  
 DOCUMENT NUMBER: 135:109740  
 TITLE: Preparation of lithium-containing materials for  
 battery cathodes  
 INVENTOR(S): Barker, Jeremy; Saidi, M. Yazid; Swoyer, Jeffrey L.  
 PATENT ASSIGNEE(S): Valence Technology, Inc., USA  
 SOURCE: PCT Int. Appl., 94 pp.  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2001053198	A1	20010726	WO 2000-US35438	20001222
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
US 6528033	B1	20030304	US 2000-484919	20000118
EP 1252093	A1	20021030	EP 2000-989532	20001222
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR				
JP 2003520405	T2	20030702	JP 2001-553213	20001222
EP 1391424	A2	20040225	EP 2003-24430	20001222
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI, CY, TR				
US 2002086214	A1	20020704	US 2001-1376	20011019
US 2003215714	A1	20031120	US 2003-461842	20030613
US 6702961	B2	20040309		
PRIORITY APPLN. INFO.:				
			US 2000-484919	A1 20000118
			EP 2000-989532	A3 20001222
			WO 2000-US35438	W 20001222
			US 2001-1376	A3 20011019

AB The invention provides novel lithium-mixed metal materials which, upon electrochem. interaction, release lithium ions, and are capable of reversibly cycling lithium ions. The invention provides a rechargeable lithium battery which comprises an electrode formed from the novel lithium-mixed metal materials. Methods for making the novel lithium-mixed metal materials and methods for using such lithium-mixed metal materials in electrochem. cells are also provided. The lithium-mixed metal materials comprise lithium and at least one other metal besides lithium. Preferred materials are lithium-mixed metal phosphates which contain lithium and two other metals besides lithium.

IT Reduction  
(carbothermic; preparation of lithium-containing materials for battery cathodes)

IT Secondary batteries  
(lithium; preparation of lithium-containing materials for battery cathodes)

IT Battery cathodes  
(preparation of lithium-containing materials for battery cathodes)

IT 12162-92-4P, lithium vanadium oxide  $\text{LiV}_2\text{O}_5$  84159-18-2P, Lithium vanadium phosphate  $\text{Li}_3\text{V}_2(\text{PO}_4)_3$  **349632-76-4P**, Iron lithium magnesium phosphate ( $\text{Fe}_{0.9}\text{LiMg}_{0.1}(\text{PO}_4)$ ) 349632-79-7P, Calcium iron lithium phosphate ( $\text{Ca}_{0.1}\text{Fe}_{0.9}\text{Li}(\text{PO}_4)$ ) 349632-82-2P, Iron lithium zinc phosphate ( $\text{Fe}_{0.9}\text{LiZn}_{0.1}(\text{PO}_4)$ )  
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)  
(preparation of lithium-containing materials for battery cathodes)

IT 546-89-4, Lithium acetate 553-91-3, Lithium oxalate 554-13-2, Lithium carbonate 1305-62-0, Calcium hydroxide, reactions 1309-37-1, Ferric oxide, reactions 1309-42-8, Magnesium hydroxide 1314-62-1, Vanadium pentoxide, reactions 1317-61-9, iron oxide  $\text{Fe}_3\text{O}_4$ , reactions 7440-44-0, Carbon, reactions 7722-76-1, Ammonium dihydrogen phosphate 7783-28-0, Diammonium hydrogen phosphate 7790-69-4, Lithium nitrate 7803-55-6, Ammonium vanadate 10045-86-0, iron phosphate  $\text{FePO}_4$  10377-52-3, Lithium phosphate 11126-15-1, Lithium vanadium oxide 12036-21-4, Vanadium dioxide 12057-24-8, Lithia, reactions 13453-80-0, Lithium dihydrogen phosphate 15060-59-0, lithium vanadium oxide  $\text{LiVO}_3$   
RL: RCT (Reactant); RACT (Reactant or reagent)  
(preparation of lithium-containing materials for battery cathodes)

IT 15365-14-7P, iron lithium phosphate  $\text{FeLiPO}_4$   
RL: SPN (Synthetic preparation); PREP (Preparation)  
(preparation of lithium-containing materials for battery cathodes)

REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L2 ANSWER 27 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2001:225610 CAPLUS

DOCUMENT NUMBER: 134:254632

TITLE: Secondary lithium batteries using lithium iron phosphate cathodes

INVENTOR(S): Takahashi, Masaya; Tobishima, Shinichi; Takei, Koji; Sakurai, Yoji

PATENT ASSIGNEE(S): Nippon Telegraph and Telephone Corp., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 8 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2001085010	A2	20010330	JP 1999-261394	19990916
JP 3504195	B2	20040308		

PRIORITY APPLN. INFO.: JP 1999-261394 19990916

AB The batteries use  $\text{Li}_z\text{Fe}_{1-y}\text{X}_y\text{P}_4$  ( $0 < z \leq 1$ ; X = element electrochem. stable in 3-4 V potential vs. Li standard potential) having olivine-type structure as the cathode active materials. Preferably, the X is Mg, Co, Ni, and/or Zn. The batteries, capable of charging and discharging at  $\leq 4$  V, inhibit decomposition of electrolyte, and show improved discharge capacity and cycling performance.

IT Secondary batteries  
 (secondary Li batteries using lithium iron phosphate cathodes)

IT Battery cathodes  
 (secondary; secondary Li batteries using lithium iron phosphate cathodes)

IT 331622-62-9P, Iron lithium nickel phosphate ( $\text{Fe}_{0.8}\text{LiNi}_{0.2}(\text{P}_4)$ )  
 331622-63-0P, Cobalt iron lithium phosphate ( $\text{Co}_{0.2}\text{Fe}_{0.8}\text{Li}(\text{P}_4)$ )  
 331622-64-1P, Cobalt iron lithium phosphate ( $\text{Co}_{0.1}\text{Fe}_{0.9}\text{Li}(\text{P}_4)$ )  
 331622-65-2P, Iron lithium zinc phosphate ( $\text{Fe}_{0.8}\text{LiZn}_{0.2}(\text{P}_4)$ )  
 331622-66-3P, Iron lithium magnesium phosphate ( $\text{Fe}_{0.85}\text{LiMg}_{0.15}(\text{P}_4)$ )

RL: DEV (Device component use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)  
 (cathodes; secondary Li batteries using lithium iron phosphate cathodes)

L2 ANSWER 28 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 2001:46145 CAPLUS

DOCUMENT NUMBER: 134:107969

TITLE: Cleanerless electrophotographic apparatus with improved durability

INVENTOR(S): Okado, Kanetsugu; Mizoe, Marekatsu; Arahira, Fumihiro

PATENT ASSIGNEE(S): Canon Inc., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 26 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2001013737 A2 20010119 JP 1999-186119 19990630  
PRIORITY APPLN. INFO.: JP 1999-186119 19990630  
AB The invention relates to the cleanerless electrophotog. apparatus which comprises a charging means containing amino-group-containing magnetic particles and showing volume resistivity of  $10^4$ - $10^9 \Omega \cdot \text{cm}$ , and a development means containing nonmagnetic toner and amino-group-containing spherical magnetic carrier particles. The volume resistivities of the magnetic carrier and the electrophotog. photoconductor are  $10^{10}$ - $10^{15}$  and  $10^8$ - $10^{15} \Omega \cdot \text{cm}$ , resp.  
IT Electrophotographic apparatus  
Electrophotographic photoconductors (photoreceptors)  
(magnetic particles for cleanerless electrophotog. apparatus with improved durability)  
IT Electrophotographic carriers  
(magnetic; magnetic particles for cleanerless electrophotog. apparatus with improved durability)  
IT 13822-56-5,  $\gamma$ -Aminopropyltrimethoxysilane 26222-39-9.  
Dimethylaminoethyl methacrylate-styrene copolymer  
RL: MOA (Modifier or additive use); USES (Uses)  
(aminosilane coupling agent on magnetic particle surfaces)  
IT 319913-53-6P, Iron lithium magnesium strontium oxide  
RL: PNU (Preparation, unclassified); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)  
(in magnetic particles for cleanerless electrophotog. apparatus with improved durability)

L2 ANSWER 29 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN

ACCESSION NUMBER: 1998:386203 CAPLUS

DOCUMENT NUMBER: 129:144051

TITLE: 7Li and 31P nuclear magnetic resonance studies of  
Li1-3xMgFexPO4

AUTHOR(S): Goni, A.; Bonagamba, T. J.; Silva, M. A.; Panepucci,  
H.; Rojo, T.; Barberis, G. E.

CORPORATE SOURCE: Facultad de Ciencias, Departamento de Quimica  
Inorganica, Universidad del Pais Vasco, Bilbao, Spain

SOURCE: Journal of Applied Physics (1998), 84(1), 416-421  
CODEN: JAPIAU; ISSN: 0021-8979

PUBLISHER: American Institute of Physics

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The authors report a 7Li and 31P NMR study in the Li1-3xMgFexPO4 phases between 150 and 410 K This study, complementary to those made using Moessbauer and magnetic neutron diffraction expts., confirms that the Fe ions enter as Fe(III) in the lattice, and that they enter substituting Li ions. Ionic conductivity measurements, together with the NMR behavior of the 7Li and 31P NMR spectra show that no Li mobility occurs in the temperature range studied even with the addition of the Fe impurity.

IT Ionic conductivity  
Mossbauer effect  
NMR (nuclear magnetic resonance)

(7Li and 31P NMR studies of  $\text{Li}_{1-3x}\text{MgFexPO}_4$ )  
IT 7723-14-0, Phosphorus-31, properties 13775-51-4, Lithium magnesium phosphate ( $\text{LiMgPO}_4$ ) 13982-05-3, Lithium-7, properties  
210709-38-9, Iron lithium magnesium phosphate ( $\text{Fe}_{0.03}\text{Li}_{0.9}\text{Mg}(\text{PO}_4)$ )  
210709-39-0, Iron lithium magnesium phosphate  
( $\text{Fe}_{0.04}\text{Li}_{0.89}\text{Mg}(\text{PO}_4)$ ) 210709-40-3, Iron lithium magnesium phosphate ( $\text{Fe}_{0.1}\text{Li}_{0.7}\text{Mg}(\text{PO}_4)$ )  
RL: PRP (Properties)  
(7Li and 31P NMR studies of  $\text{Li}_{1-3x}\text{MgFexPO}_4$ )  
REFERENCE COUNT: 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

- L2 ANSWER 30 OF 30 CAPLUS COPYRIGHT 2004 ACS on STN  
ACCESSION NUMBER: 1993:71061 CAPLUS  
DOCUMENT NUMBER: 118:71061  
TITLE: Synthesis and conductivity of new lithium-containing Nasicon-type phases:  $\text{Li}_x[\text{MII}_x\text{MIII}_{2-x}](\text{SO}_4)_3\text{-y}(\text{SeO}_4)_y$  and  $\text{Li}_x[\text{Lix}/2\text{MII}_{2-x}/2](\text{SO}_4)_3\text{-y}(\text{SeO}_4)_y$   
AUTHOR(S): Slater, Peter R.; Greaves, Colin  
CORPORATE SOURCE: Sch. Chem., Univ. Birmingham, Birmingham, B15 2TT, UK  
SOURCE: Journal of Materials Chemistry (1992), 2(12), 1267-9  
CODEN: JMACEP; ISSN: 0959-9428  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB The synthesis of new phases,  $\text{Li}_x[\text{MxIIM}_2\text{-xIII}](\text{SO}_4)_3\text{-y}(\text{SeO}_4)_y$  and  $\text{Li}_x[\text{Lix}/2\text{M}_2\text{-x}/2\text{III}](\text{SO}_4)_3\text{-y}(\text{SeO}_4)_y$  with the Nasicon structure is reported. The ionic conductivities of a range of samples were measured, with the highest conductivity ( $\sigma_{473} = 1.6 \times 10^{-4} \Omega^{-1} \text{cm}^{-1}$ ) being observed for  $\text{Li}_{0.5}[\text{Mg}_{0.5}\text{Fe}_{1.5}](\text{SO}_4)_3$ . Attempts to increase the Li content by partially replacing the (S,Se) $\text{O}_4$  groups by  $\text{PO}_4$  or  $\text{SiO}_4$  proved unsuccessful. The synthesis of mixed Na- and Li-containing samples is reported.  
IT Electric conductors, ceramic  
(lithium mixed metal sulfates and selenates, preparation and structure of Nasicon-type)  
IT Crystal structure  
(of lithium metal sulfates and selenates)  
IT Electric conductivity and conduction  
(ionic, of lithium mixed metal sulfates and selenates)  
IT 145481-51-2 145700-36-3 145700-37-4, Aluminum lithium magnesium sodium sulfate  $\text{AlLi}_{0.5}\text{MgNa}_{0.5}(\text{SO}_4)_3$  145700-38-5, Aluminum lithium magnesium sodium selenate  $\text{AlLi}_{0.5}\text{MgNa}_{0.5}(\text{SeO}_4)_3$   
RL: PRP (Properties)  
(crystal structure and conductivity of)  
IT 145481-43-2P, Aluminum lithium nickel sulfate ( $\text{Al}_{1.65}\text{Li}_{0.35}\text{Ni}_{0.35}(\text{SO}_4)_3$ )  
145481-44-3P, Aluminum lithium zinc sulfate ( $\text{Al}_{1.65}\text{Li}_{0.35}\text{Zn}_{0.35}(\text{SO}_4)_3$ )  
145481-45-4P 145481-46-5P, Aluminum lithium nickel selenate  
( $\text{Al}_{1.6}\text{Li}_{0.4}\text{Ni}_{0.4}(\text{SeO}_4)_3$ ) 145481-47-6P, Aluminum lithium zinc selenate  
( $\text{Al}_{1.6}\text{Li}_{0.4}\text{Zn}_{0.4}(\text{SeO}_4)_3$ ) 145481-48-7P, Iron lithium nickel sulfate  
( $\text{Fe}_{1.6}\text{Li}_{0.4}\text{Ni}_{0.4}(\text{SO}_4)_3$ ) 145481-49-8P, Iron lithium zinc sulfate

(Fe<sub>1.6</sub>Li<sub>0.4</sub>Zn<sub>0.4</sub>(SO<sub>4</sub>)<sub>3</sub>) 145481-50-1P, Chromium lithium nickel sulfate  
(Cr<sub>1.6</sub>Li<sub>0.4</sub>Ni<sub>0.4</sub>(SO<sub>4</sub>)<sub>3</sub>) 145700-27-2P, Aluminum lithium magnesium sulfate  
al<sub>1.5</sub>li<sub>0.05</sub>mg<sub>0.5</sub>(so<sub>4</sub>)<sub>3</sub> 145700-28-3P, Aluminum lithium sulfate  
al<sub>1.8</sub>li<sub>0.6</sub>(so<sub>4</sub>)<sub>3</sub> 145700-29-4P, Aluminum lithium magnesium selenate  
al<sub>1.5</sub>li<sub>0.5</sub>mg<sub>0.5</sub>(seo<sub>4</sub>)<sub>3</sub> 145700-30-7P, Aluminum lithium selenate  
al<sub>1.8</sub>li<sub>0.6</sub>(seo<sub>4</sub>)<sub>3</sub> **145700-31-8P**, Iron lithium magnesium sulfate  
fe<sub>1.5</sub>li<sub>0.5</sub>mg<sub>0.5</sub>(so<sub>4</sub>)<sub>3</sub> 145700-32-9P, Iron lithium sulfate  
fe<sub>1.8</sub>li<sub>0.6</sub>(so<sub>4</sub>)<sub>3</sub> 145700-33-0P, Chromium lithium magnesium sulfate  
cr<sub>1.5</sub>li<sub>0.5</sub>mg<sub>0.5</sub>(so<sub>4</sub>)<sub>3</sub> 145700-34-1P, Chromium lithium zinc sulfate  
cr<sub>1.5</sub>li<sub>0.5</sub>zn<sub>0.5</sub>(so<sub>4</sub>)<sub>3</sub> 145700-35-2P, Chromium lithium sulfate  
cr<sub>1.8</sub>li<sub>0.6</sub>(so<sub>4</sub>)<sub>3</sub>

RL: PREP (Preparation)

(preparation and structure and conductivity of)